Emanuel Swedenborg Prophet of the Higher Evolution

BY

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An Exposition of the Cosmic Theory set forth by Emanuel Swedenborg

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PREFACE

THIS work does not lay claim to a place in the scientific category, though I have endeavored to handle the material in a scientific spirit.

My object is threefold: (1) to give an exposition of the cosmic theory set forth by Emanuel Swedenborg between 1717 and 1772 and to indicate its position in the history of the evolutionary hypothesis, (2) to show how far science now carries us in explaining the evolutionary process and where it reaches its limits; and (3) to attempt to indicate how Swedenborg points the way to a more complete solution. Where his theory is exposed to scientific examination, we find some positions right, some wrong, and some in doubt. I have attempted a confirmation of certain of them by reference to known facts. If fuller investigations prove that I have erred, I shall most willingly revise my opinions. Far from feeling distress at the disproof of his preconceptions, one who really believes in a Divine Architect of the universe will be genuinely eager to accept every new, thoroughly tested discovery of science. His faith is pitiably weak if for the demonstration of its Divine origin he presumes that truth

needs any re-editing at his incompetent hands. One of the mournful spectacles of our day is the sight of so many priests of the Almighty trying to view Him by the candle light of man-made dogmas and turning their backs on His own glorious sunshine. If they will prayerfully study their Lord's Bible in the light of their Lord's universe, they will discover a new meaning in the Jewish precept quoted by their Master that "the testimony of two men is true," and in His assertion immediately afterward: "I am one that beareth witness of myself, and the Father that sent me beareth witness of me." It is because Swedenborg helps me to discover the agreement between these two witnesses, the revelation through the Word and the revelation through the world, that I entertain for him the regard to which these pages bear witness.

The crudity of my attempt I fully realize, but I have undertaken work in a field which has been too little cultivated and I hope to stimulate others to a more successful exploitation of it.

Special thanks are due the editor for permitting very considerable changes in the text which the remorseless advance of science and the expansion of my own conceptions rendered desirable.

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THE MEANING OF EVOLUTION

THE word *evolution,* "to roll from," is constantly contrasted in modern discussions with *creation,* the implication being that, while the latter assumes a Creator, the former carries the idea of a self-operating, self-sufficient unfoldment. This is, however, incorrect. Creation implies, indeed, a Creator, but evolution is not its antithesis. It is simply a non-committal term. Like our neuter verbs, "it thunders," "it rains," "it snows," evolution merely states that a process has taken place, without indicating the means by which it took place. There may have been an Evolver or there may not; the term by itself does not specify.[1]

As a striking instance of a mistake of the kind referred to may be mentioned the article on "Evolu-

[1] *The Scientific Monthly* for July, 1926, contains an article by Prof. G. T. W. Patrick, entitled "The Convergence of Evolution and Fundamentalism," which follows my own line of thought in a considerable measure. In this paper, the author suggests that *epigenesis,* "building up," would be a more appropriate term than evolution (pp. 5-15).

tion" in the *Encyclopaedia Britannica* (11th Edition), from which I quote the following sentences:

> "In the modern doctrine of evolution the cosmic system appears as a natural product of elementary matter and its laws. The various grades of life on our planet are the natural consequences of certain physical processes involved in the gradual transformations of the earth. Conscious life is viewed as conditioned by physical (organic and more especially nervous) processes, and as evolving itself in close correlation with organic evolution."

The writer of this contribution, in assuming to know that "the various grades of life on our planet are the natural consequences of certain physical processes" and that "conscious life" may be viewed as "evolving itself," passes over from science to metaphysics, and makes assumptions not warranted by the facts. It is only fair to add that most scientific writers of standing escape this pitfall.

Another common supposition is that evolution is distinguished from creation by the fact that it is relatively slow, and this is natural but equally misleading. One of the reasons for such an error is, of course, the association of creation in general with the particular narrative of creation contained in the first chapters of our Bible. But, unless one is com-

mitted to a belief in the literal accuracy of that or some similar narrative, the element of time need not enter into the question.

In order to place our discussion on really firm ground let us consider several definitions which are free from misinterpretation.

According to Herbert Spencer's famous characterization, "Evolution is an integration of matter and concomitant dissipation of motion; during which the matter passes from an indefinite, incoherent homogeneity to a definite, coherent heterogeneity, and during which the retained motion undergoes a parallel transformation." [1]

Webster's Dictionary defines evolution as "the theory that the various types of animals and plants have developed by descent with modification from other pre-existing types, as opposed to the old theory of the separate creation of each species."

The article on evolution in Hastings's *Encyclopaedia of Religion and Ethics* informs us that "in the history of biological thought the term 'evolution' has had more than one meaning. It has, however, been more especially used to denote those views on the interrelation of living things which imply the conception of the mutability of species, now so closely associated with the name of Charles Darwin."

"Evolution, or development," says Huxley in "Evolution in Biology," "is, in fact, at present em-

[1] "First Principles," §145.

ployed in biology as a general name for the history of steps by which any living being has acquired the morphological and the physiological characters which distinguish it." In his "American Addresses" occurs the following: "The hypothesis of evolution supposes that in all this vast progression there would be no breach of continuity, no point at which we could say, 'This is a natural process,' and 'This is not a natural process': but that the whole might be compared to that wonderful process of development which may be seen going on every day under our eyes, in virtue of which there arises, out of the semi-fluid, comparatively homogeneous substance which we call an egg, the complicated organization of one of the higher animals. That, in a few words, is what is meant by the hypothesis of evolution." [1]

The definition given by Spencer is the most famous of these, and has the merit of covering inorganic and organic evolution alike, but it conforms better to the conceptions of a time when protoplasm, the basis of organic life, was thought to be "a simple, undifferentiated substance" than to the period of present day science, when it is regarded as one of the most complicated associations of matter known.

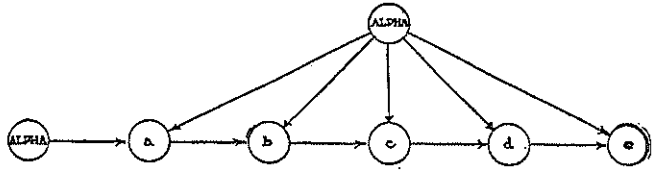
The remaining interpretations confessedly limit themselves to organic evolution, and organic evolution is in fact what most people have in mind when the subject is mentioned. Two of them stress the

[1] American Addresses, London, 1877, p. 10.

question of the mutability of species about which so much of the early controversy over evolution turned. Huxley's characterizations are, however, the most satisfactory and his reference to the egg has an especial significance for us which will appear later.

In essence, the hypothesis of organic evolution considers that all plants and animals constitute one family tree, the individuals being genetically related by ascent (or descent) from a common parentage, *i. e.*, from the first organisms upon our planet. We animate beings are all cousins to one another.

Although inorganic evolution and organic evolution differ markedly, they have this in common, that each postulates the production of one unit out of a pre-existing unit in ways with which our experience of the natural world makes us familiar. The following diagram will illustrate:



Here *a*, *b*, *c*, *d*, and *e* represent so many substances or so many organisms. In this series *e* is derived or evolved from *d*, *d* from *c*, *c* from *b*, and *b* from *a*. Of course new substances usually arise by the combination of two or more preexisting substances and each

organism is ordinarily the product of two parent organisms, but we need not complicate our thoughts with such considerations. Our immediate purpose is to get a clear idea of what is essential in the evolutionary concept.

In tracing the evolution of *e* from *a* I have not said anything about the force acting to produce this result, and it is because scientists seldom mention such a force that they are supposed to teach the self-evolution of the universe and are accused of atheism. But failure to mention a cause is not denial of the cause, any more than the failure of a clergyman to render thanks openly for every blessing he experiences is proof of his rejection of an underlying Providence. Some short-sighted theologians would be quite content if the evolutionist would but postulate the Deity (*Alpha* to the left) as the cause of the first of the evolutionary series, *a*. But this is merely a subtle type of atheism, and the true relation which the Deity bears to *a-e* is represented by the circle overhead, connected with each member of the series independently. But of this more later. The thought to hold in mind for the present is that evolution involves the successive production of substance from substance, or organism from organism, on the material plane, as represented by the series *a-e*.

HISTORY OF THE DOCTRINE OF EVOLUTION

As the apparent production of one thing from another is a matter of daily and universal experience, it was inevitable that theories suggestive of evolution should make their appearance as soon as men began to reason about the origin of the material universe, and it is not strange that, in the resulting flood of speculation, elements similar to those contained in modern evolutionary hypotheses should be found. These have been pointed out in recent years by a number of indefatigable students. Suggestions are discoverable, indeed, in the crude imaginings of primitive peoples everywhere, in which the animate is continually represented as produced out of the inanimate—and *vice versa*. Coming to the Greeks, we find an evolutionary premonition in the view of Thales, the father of Greek philosophy, that water was the original substance of the cosmos, and in that of Anaximines, who traced everything to air. Such suggestions are still more apparent in the philosophies of Anaximander, the teacher of Anaximines, of Empedocles, Anaxagoras, Archelaus, Democritus, and the Epicureans, culminating in the great work of the Roman poet Lucretius, *De Rerum*

Natura. The temper of the Christian Fathers was so foreign to evolutionary thought that, except for Gregory of Nyssa, Augustine, and Thomas Aquinas, comparatively few traces of it are to be found until learning revived in the sixteenth and seventeenth centuries and a return to Greek ideas brought renewed trends toward the evolutionary viewpoint. We observe these in the systems of Telesio and Bruno, and, in his *Principia Philosophiae* (Amsterdam, 1644), Descartes, under the guise of a mere speculation, "laid the foundation of the modern mechanical conception of nature and of physical evolution".[1] It is particularly important for us to note this fact because Descartes was an immediate predecessor of Swedenborg and exerted great influence upon him.

Swedenborg's first speculations on origins were committed to writing in 1717; the earliest extended statement of his cosmological views, the so-called *Lesser Principia*, was made in 1720; but these were not given to the world in their matured form until 1734, when they appeared in the first part of a three volume work entitled *Opera Philosophica et Mineralia*. This first volume is usually called the *Principia*, though a full translation of its Latin title is *The First Principles of Natural Things, Being New Attempts toward a Philosophical Explanation of the Elementary World*. In it Swedenborg gives his

[1] *Encyclopaedia Britannica*, article on "Evolution."

hypothesis regarding inorganic evolution, from the simplest substance created by the Infinite to the planetary crust. Afterwards he turned his attention almost entirely to the study of organisms, particularly the human body, and wrote and published voluminously upon the subject. He did not produce any work on organic evolution comparable to his *Principia*, but at the very end of his scientific career gathered into one small, uncompleted treatise, *The Worship and Love of God*, an exposition of all of his theories as to the development of the earth and its occupants. The first two parts of this were written in 1744 and 1745 and were published in London in the latter year. The third part, also dating from 1745, was left unfinished, though the material was partially set up. It appeared finally in an English translation, along with the other parts, in Boston, in 1914.[1] In this work Swedenborg's real conclusions are somewhat masked owing to the poetic form into which the statement of his theories had been cast. What those conclusions were, we shall consider in a later chapter. His views on cultural evolution are also suggested in this work, but more fully in his theological writings, particularly the *Arcana Coelestia*.

The hypothesis of inorganic evolution set forth in Swedenborg's *Principia* was the first attempt by any

[1] The Worship and Love of God. by E. Swedenborg. Published by the Trustees of Lydia S. Rotch, Mass. New-Church Union, 134 Bowdoin St., Boston, 1914.

student to present a complete mechanical theory of the evolution of the cosmos. In 1750 Thomas Wright made suggestions along similar lines, and in 1755 Immanuel Kant outlined a hypothesis having many points in common, but the attention of the learned world was first drawn to this subject in 1796, when Pierre Simon Laplace, a great French mathematician and astronomer, published his famous statement of the nebular hypothesis in his *Exposition du Système du Monde*. It is worth remembering that this celebrated theory saw the light in the humble position of a footnote. A more interesting point for us is the fact that Laplace confessed to having received the suggestion which resulted in this hypothesis from Buffon, and that a copy of the *Principia* of Swedenborg is known to have been in Buffon's library. That the idea was actually passed on to Laplace from Swedenborg we cannot absolutely affirm, but the evidence is very nearly complete.

The new theory was taken up with enthusiasm by Sir William Herschel, who amplified it in several important particulars. It was strengthened by Helmholtz's demonstration (1854) that solar heat might be maintained by a slow contraction of the sun's sphere, and in 1864 by Huggins's discovery of the gaseous nature of some nebulae. But later studies in celestial mechanics have shown that Laplace's theory is inapplicable to our solar system. The Meteoric Hypothesis of Sir Joseph Lockyer (1890),

which sought to develop the system from swarms of meteorites, evoked more dissent than approval. The most noted theory of recent times is the planetesimal hypothesis of Chamberlin and Moulton, according to which the planets and their satellites have been built up from meteoric dust resulting from the partial disruption of two suns brought into too close contact with each other. We now know that spiral nebulae, which these students believed would be produced in this manner, are of entirely different origin, but this fact does not necessarily invalidate the theory. One of the most recent speculations along this line is that of J. H. Jeans of Cambridge, England, which, however, is still on trial.[1]

The doctrine of inorganic evolution is generally accepted, even though the course which that evolution pursued is in doubt. It seems to be agreed that the groups into which stars have been classified spectroscopically represent so many distinct grades in stellar development, the red classes, which have the lowest temperatures, comprising both the youngest and the oldest, while the others represent intermediate stages, running a gamut from red through orange, yellow and white to blue and, with decreasing temperature, in reverse order to red once more. At the same time our new knowledge of radioactivity has led astronomers and physicists to grant an

[1] Set forth in a discourse at the Royal Institution, Feb. 15, 1924; printed in the supplement to *Nature*, Mar. 1, 1924, and reprinted in the *Annual Report of the Smithsonian Institution* for 1924.

enormous extension of the life period allowed each solar body. Professor Eddington thinks that our own sun must be something like ten billion years old and may continue fifteen trillion years longer. Nor would the extinction of a single star involve that of the cosmos—which, in fact, seems to be impossible if the theory of Relativity is correct.

The doctrine of organic evolution became more and more popular after Swedenborg's time. We owe the word evolution itself to Charles Bonnet (1720-1793), who, in 1762, propounded a theory "that the embryo or germ, instead of being brought into existence by the process of fecundation, is a development or expansion of a pre-existing form, which contains the rudiments of all the parts of the future organism." Thus he believed that the hen's egg contains a minute but complete chick which fecundation merely causes to develop. This, of course, is a very different sort of evolution from the process to which we now apply the term.

Modern evolution, to quote again from the Britannica article, "can be traced historically to the influence of several converging lines of philosophical speculation and of physical observation, none of which go farther back than the seventeenth century," and these may be summarized as follows:

"1. The enunciation by Descartes of the conception that the physical universe, whether living

or not living, is a mechanism, and that, as such, it is explicable on physical principles.

"2. The observation of the gradations of structure, from extreme simplicity to very great complexity, presented by living things, and of the relation of these graduated forms to one another.

"3. The observation of the existence of an analogy between the series of gradations presented by the species which compose any great group of animals or plants, and the series of embryonic conditions of the highest members of that group.

"4. The observation that large groups of species of widely different habits present the same fundamental plan of structure and that parts of the same animal or plant, the functions of which are very different, likewise exhibit modifications of a common plan.

"5. The observation of the existence of structures, in a rudimentary and apparently useless condition, in one species of a group, which are fully developed and have definite functions in other species of the same group.

"6. The observation of the effects of varying conditions in modifying living organisms.

"7. The observation of the facts of geographical distribution.

"8. The observation of the facts of the geological succession of the forms of life."

Passing again with a mere mention the name of that many-sided savant, Buffon, who seems to have believed that species are not through all time unalterable, and who exerted a powerful influence in swinging the thoughts of his contemporaries and successors toward the evolutionary viewpoint, we come to the first proponent of modern organic evolution, the man who was to give his name to one of the two great schools of evolutionary thought, Jean Baptiste Lamarck (1744-1829). Lamarck explained the structure of animals and their several organs by the four following laws[1]:

1. "Life by its proper forces tends continually to increase the volume of every body possessing it, and to enlarge its parts, up to a limit which it brings about.

2. "The production of a new organ in an animal body results from the supervention of a new want (*besoin*) continuing to make itself felt, and a new movement which this want gives birth to and encourages.

3. "The development of organs and their force of action are constantly in ratio to the employment of those organs.

4. "All which has been acquired, laid down, or changed in the organization of individuals in the course of their life is conserved by generation and

[1] Quoting from the *Encyclopaedia Britannica*, art., "Lamarck."

transmitted to the new individuals which proceed from those which have undergone those changes."

In other words, want causes a tendency to action in a certain direction which results in the addition of new organs or the suppression of old organs, and the changes so brought about are transmitted to succeeding generations. The fourth of the above laws is the famous doctrine of "the inheritance of acquired characters." Lamarck has been accused of believing that organs are directly willed into existence by the animal, but he does not say this. He merely maintains that altered wants lead to altered habits, which in time result in organic changes through use and disuse.

Unfortunately for Lamarck he was opposed by Cuvier, whose pronouncements had the force of *ex cathedra* utterances among the scientists of the time, and Lamarck and his theories were generally ridiculed. About thirty years after his death, however, the main principle for which he had been contending was presented to the biological world in such a convincing manner that it rapidly gained support among scholars and was finally accepted as the basal working hypothesis for all scientific investigation.

But this later form of the theory introduced a new principle, natural selection, which, as is well known, was independently hit upon by Charles Darwin (1809-1882) and Alfred Russel Wallace (1823-

1913). Darwin's interest in the modification of species dates from the voyage which he undertook between 1831 and 1836 as naturalist of the *Beagle* on a surveying trip to the Cape Verde Islands, the coast and islands of South America, and around the world by way of the South Pacific. His observations on that trip, but especially on the animal life of the Galapagos Islands, off the west coast of South America, led him to a belief in the transmutation of species, and he made this the object of his studies for the next twenty years while publishing the scientific results of the expedition. In June, 1858, however, he received a paper from his friend Wallace setting forth the same theory as the result of investigations in the East Indies. Darwin explained the situation to his friends Lyell and Hooker, and, by their advice, Wallace's paper, accompanied by an abstract of Darwin's own work, and an explanatory letter from his two friends, was forwarded to the secretary of the Linnaean Society. The joint communication was read before that Society on July 1, 1858, and was published in its Journal the same year. Darwin then set about the preparation of a volume upon the subject, which appeared on November 24, 1859. This was the famous "Origin of Species." The scarcely less epochal "Descent of Man" was published in 1871.

With the storm of controversy which followed the publication of these works, the story of the

steady headway which the new views gained, and their very general acceptance by the scientific world, we need not concern ourselves. They are too well known.

In formulating his famous hypothesis Darwin was profoundly influenced by Thomas Malthus, an English clergyman and economic theorist, who had discovered that while the available food supply of the world was increasing by arithmetical progression, population increased in geometrical progression.[1] Organic life, it seemed, must increase more rapidly than the means of supporting it until a definite limit was reached. That having been attained, it was evident that only a certain number of the organisms produced could come to maturity, and it was natural to suppose that those which did so would be not merely the most vigorous but the best suited to the given conditions. It is a matter of common knowledge that individual animals and plants vary, and there is every reason to suppose that some variations will be more advantageous—or less disadvantageous—to the organism possessing them. The environment will then, sieve-like, strain out the forms best fitted to survive and eliminate the rest. Or, to describe the process more exactly, "accidental variations" will thus be thrown into competition by the excessive rate of multiplication on the

[1] The first edition of his work, "An Essay on the Principle of Population as It Affects the Historic Improvement of Society," appeared in 1798, but later editions were greatly altered.

part of organisms, a "struggle for existence" will result, the "elimination of the unfit" and the "survival of the fit" through "natural selection" follow, and finally the transmission to future generations of the advantageous characters thus selected. "Sexual selection," the mating of vigorous and successful types and the suppression of the others, may be considered as a supplement to the general theory of natural selection and need not be considered independently. We may note in passing that investigation has shown the animals who possess certain characters which, from our point of view are aesthetic, to be wholly unconscious of the fact.

After evolution had been accepted by the great body of scientists, a division began among them which resulted in the so-called Neo-Lamarckian school, attributing the origin of new forms mainly to the inheritance of acquired characters, and the Neo-Darwinian school which laid principal stress on natural selection. Between 1868 and 1876, however, August Weismann (1834-1914) published a series of papers [1] in which he attacked the assumption that acquired characters are inheritable, and his main contention has been substantiated so completely by later investigators that the Neo-Lamarckian position has tended to fall into disrepute. Yet certain students maintain the old Lamarckian thesis

[1] They appeared in an English translation in 1882 under the title, "Studies in the Theories of Descent."

with vigor and the question cannot be considered settled.[1]

Even before Weismann's articles appeared, a work had been published destined to affect the Neo-Darwinians almost as profoundly, if not as destructively, as the former had the opposing school. In 1866 Gregor Mendel (1822-1882), abbot of a monastery at Brünn, Austria, gave to the world the results of his experiments on plants tending to show that inheritance does not always pass from one generation to the next in microscopic quantities as had been universally assumed, but by certain distinct increments. He found that, when tall and dwarf sweet peas were crossed, all of the resulting plants were tall, but when the latter were allowed to cross in turn, one-quarter of the next generation were dwarfs and three-quarters tall. He also found that, while the dwarf plants and one-third of the tall plants, when crossed again, always bred true, two-thirds of the tall plants, *i. e.*, one-half of all, yielded offspring in the same ratio as before, three tall to one dwarf. When round-seeded and wrinkled-seeded peas were crossed, all of the plants arising from them had round seeds, but in the third generation the seeds segregated in the same proportions as the tall and dwarf plants, one-fourth round-seeded and one-fourth wrinkled-seeded plants breeding true, and

[1] Since this was written H. L. Muller has actually produced new characters by the use of X-rays and has shown them to be inherited. His experiments have been verified.

one-half round-seeded plants producing a similar impure offspring. Thus tallness appeared to be more potent than dwarfness and round-seededness more potent than wrinkled-seededness. Mendel discovered five other characters in the sweet pea which behaved in this manner; he named all of these "unit characters," calling those which prevailed "dominant," and those which were suppressed "recessive."

Mendel's paper lay unnoticed until 1900, when similar phenomena were observed independently by three students, Hugo de Vries, C. Correns and E. Tschermak, and the earlier work of Mendel was brought to light. Further investigations indicated that the transmission of "unit characters" was closely dependent on the chromosomes of the cell nucleus. Later it was ascertained that characters were often associated, not with chromosomes as wholes, but with specific parts of them, the "genes," and that complications of various kinds entered into the problem of heredity not suspected at the beginning of the investigation. It was also found that the conception of an immutable "unit character" must be given up, since in some cases fifty or more distinct genes are necessary to the production of a single such character, the absence of any one of which will prevent it from developing.[1] It is to be observed, moreover, that Mendelism concerns itself,

[1] Herbert S. Jennings, "Heredity and Environment," in *The Scientific Monthly* for September, 1924.

not with the introduction of new characters, but with the transmission of characters already in existence. Therefore, while Mendelism has added an important chapter to the general study of heredity, it has not furnished a clue to the appearance of those entirely new organic elements which alone make evolution possible.

Regarding the evolution of human culture, there have been two diametrically opposed views from a very early period. One school of thought, represented typically by the Roman poet Lucretius, has held, and holds, that man started on a level with the animals and has, upon the whole, moved pretty steadily upward ever since. The other school, which is perhaps older, has always maintained that he attained a high level of perfection at some period in the remote past, suffered a fall, and has since been striving to regain his lost position. In Greek legend the period of perfection is known as the Golden Age, and it is represented in our Bibles by the Garden of Eden, while various primitive tribes refer to it as the time when the gods or "myth people" lived with men. Scientists have always inclined toward the former view and thinkers of strong religious instincts toward the latter, for reasons which it is not difficult to comprehend. The former approach man from the side of his earthly contacts; the latter conceive of him as, from the very begin-

ning, a child of God. Scientists view him as the culmination of a long series of natural processes leading upward from the lowest levels of the material world; theologians think of him as sprung, interiorly at least, immediately from the Source of all prefection, and they hold that, as the generations of men lengthened from the period of creation, he must have fallen away progressively from his pristine virtue and purity. The evils and disorders which afflict mankind today seem to them confirmatory of such an hypothesis. Paleontological evidence, however, rather tends to uphold the less spiritual view. Let us consider it.

Geologic time is divided into the Archaeozoic or Archaean, Proterozoic, Palaeozoic, Mesozoic, and Cenozoic eras. The Palaeozoic deposits were originally called Primary, although, as indicated by the list of eras just given, they do not represent the oldest formations. Hence the Mesozoic deposits are known as Secondary, while the Cenozoic era is divided into the Tertiary and Quaternary. It is with these two last that we are here concerned. The first of them, the Tertiary, also called the Age of Mammals, is subdivided into the Eocene, Oligocene, Miocene, and Pliocene epochs, named in accordance with the proportion of living forms in the fossil remains of each. It is generally agreed among paleontologists and archeologists that the earliest human remains must be looked for either toward the close of the

Miocene or in the Pliocene. The most primitive types of implements, crudely worked flints known as eoliths, are found in the strata from these two epochs and, indeed, fractured flints claimed as eoliths are reported in still earlier horizons. However, so many of them resemble flints fractured by natural causes that some investigators are inclined to throw out the evidence of the eoliths entirely. The balance of opinion, nevertheless, inclines to an acceptance of certain types and admits that they furnish indications of the presence of man throughout most of the Pliocene epoch. At the very end of this epoch, or the opening of the Quaternary period, the evidence of the eoliths is supplemented by finds of a more satisfactory character. The earliest of these,[1] a skull cap, a left thigh bone, and three teeth, discovered by Eugene Dubois in Java in 1891, more nearly meet the requirements of a "missing link" than any that have come to our knowledge up to the present time. The skull is of small capacity, although distinctly above that of an ape, but the primitive character of the form of life revealed caused Dubois, with the endorsement of other scientists, to place the being from which the remains came in a distinct genus and to bestow upon it the name *Pithecanthropus erectus*. Until recently this being was supposed to have walked the earth about half a million years ago, but the tendency now is to

[1] Except possibly the Piltdown remains.

push this date back nearly as far again. Keith, indeed, reduces it to two hundred thousand years or less, but he has few followers. In general it may be said that it is much more difficult to determine the absolute age of geological remains than their relative ages.

Another set of remains, which may or may not have been older than the last, was found near Piltdown Common, Fletching (Sussex), England, and consists of parts of two skeletons, as far as may be judged of the same general type. The skull of the one first brought to light, and the more important, is computed to have had a capacity of not more than 1,260 cu. c., distinctly below the average for modern man but well above that of any anthropoid. The reputed lower jaw is so simian in its characters that it may have belonged in reality to an ape, its association with the skull being purely accidental. This appears improbable, but the point is still in dispute.

In 1907 there was found at Mauer, near Heidelberg, Germany, a single lower jaw, and the species of man to which it belonged is hence called *Homo heidelbergensis*. This find is dated between 250,000 and 500,000 B. C.

Omitting a few finds of lesser importance, we now come to a race distinct from any so far described, except perhaps that last mentioned, *Homo heidelbergensis*, but represented by so many skeletons and

parts of skeletons that, in considering it, where we before groped we are now treading upon firm ground. This species of man is called *Homo neanderthalensis*, after a French station where his remains are prominent, or *Homo mousteriensis*, because, as we shall presently see, he falls mainly in a cultural period which had independently received the name Mousterian. The men of this race were distinctly shorter than the average man of today and they walked with a slight stoop. Their frontal lobes were poorly developed and they had very pronounced supraorbital ridges which would have given them an unpleasant look to one accustomed to our present standards of beauty.

While we do not have a complete series of skeletons illustrating all of the epochs of Quaternary time, we do have a fairly satisfactory succession of flint and metal artifacts, and on the basis of these the cultural history of man has been divided into the Stone, Bronze, and Iron ages, a Chalcolithic or Copper age being sometimes intercalated between the two first. The Stone Age is divided into the Paleolithic and Neolithic periods, often, but less properly, known as the ages of chipped stone and polished stone. The first is again divided—from below up—into the Pre-Chellean, Chellean, Acheulian, Mousterian, Aurignacian, Solutrean, and Magdalenian epochs; and the second into the Azilian-Tardenoisian, Maglemosian, Campignian, Roben-

hausian, and Carnacian.[1] The Heidelberg and Piltdown finds have been placed in the Pre-Chellean or the Chellean epoch, considerable doubt attaching to their proper location, but there is no question whatever regarding the principal period when the species of man called *Homo neanderthalensis* flourished. It is identified absolutely with Mousterian time, the only question being as to the first appearance of the type, which some place as far back as the Acheulian or Chellean, or even earlier, and connect with the man of Heidelberg.

At the end of Mousterian time Neanderthal man disappears completely and his place is taken by types called Cro-Magnon, Laugerie and Chancelade, which we recognize as of the same species as ourselves, *i. e.*, *Homo sapiens*. In one place we encounter skeletons of a negroid cast, the Grimaldi man, but these negroids were evidently poorly represented in Europe taken as a whole. To the Cro-Magnons and their contemporaries are to be attributed countless remarkable cave carvings and paintings which have been brought to light only within recent years. Men of their type have prevailed in Europe ever since, through the Neolithic period and the Bronze and Iron ages, right down to modern times. The principal change which has taken place seems to have been the introduction of a broad-headed stock, the

[1] Following, for the most part, G. G. MacCurdy, *Human Origins*, 2 vols., New York, D. Appleton & Co., 1924. The Azilian-Tardenoisian epoch is sometimes known as the Mesolithic or "Middle Stone Age."

so-called Alpines, about the beginning of the Neolithic period, between the long-headed, short and dark Mediterraneans and the long-headed, tall and blond Nordics of the Baltic.[1]

We must add that the succession of peoples and cultures above given seems to have extended over most of the Old World, although they did not occupy all sections of it synchronously. Artifacts of types classifiable readily under one or other of the Paleolithic divisions have been collected in northern Africa, southwestern Asia, eastern Europe, and even Central Africa and Mongolia. It is of particular interest to us to know that Mousterian finds have been made in southern Russia, the Caucasus, northern China, northern Africa, and southwestern Asia. In many of these places human remains have come to light, and of exceptional importance is the recent discovery of a Neanderthal skeleton near the Lake of Galilee.

[1] Broad-headed skulls have, nevertheless, been found in deposits of Solutrean age, or even earlier.

SWEDENBORG'S METHODOLOGY

BEFORE attempting to outline Swedenborg's cosmic theories, it will be proper to say something about the manner in which he approached his work and the principles which he kept in mind in its pursuit, his "methodology." Although couched in language become rather strange to our eyes, this is just what Swedenborg gives us in Chapter I of his *Principia,* entitled "The Means Leading to True Philosophy and the True Philosopher."

The word philosophy is here used in the general sense which it had before science and philosophy were sharply differentiated, and Swedenborg's definition suggests something scientific rather than something metaphysical. He says: "By philosophy we here mean the knowledge of the mechanism of our world, or of whatever in the world is subject to the laws of geometry, or which it is possible to unfold to view by experience, assisted by geometry and reason."[1] Experience, geometry, and reason are, indeed, the three means by which this knowledge is to be reached and the origins of things explored. In Swedenborg's time students of nature were oftener

[1] *The Principia, or the First Principles of Natural Things,* etc., by Emanuel Swedenborg. Eng. trans., London, 1912, vol. I, p. 2.

content to observe her in the open than to attempt to carry her captive into a laboratory and put her through her paces under "controlled" conditions, and therefore Swedenborg speaks of experience rather than experiment. "By experience we mean the knowledge of everything in the world of nature which is capable of being received by the senses. This definition embraces everything of nature, whether in the elementary kingdom, or in metallurgy, chemistry, botany, anatomy, etc., in so far as we can ascertain the manner in which it affects the senses or acts *a posteriori.*"[1] As Swedenborg uses the word, geometry has a peculiar look, but the manner in which he couples it with "rational philosophy," plus the testimony of the following quotation, shows that he has in mind inductive reasoning. "The second means leading to wisdom, by which the secrets of invisible nature may be unlocked and revealed, is geometry and rational philosophy; by means of which we are enabled to compare our experiments, to set them in order analytically, to reduce them to laws, rules, and analogies, and thence to elicit some third or fourth thing which was unknown before."[2] The importance of geometry for him lay in the fact that the world is mechanical, and therefore geometry "accompanies the world from its first origin, or first boundary, to its last."[3] Only the Infinite and the

[1] *The Principia, op. cit.,* p. 4.
[2] *Ibid.,* p. 16.
[3] *Ibid.,* p. 17.

human soul cannot be explored by means of geometry, because they are above it.[1] By "reason," the third means of attaining to wisdom, Swedenborg as evidently intends deduction. "The faculty of reasoning correctly, and of arriving at the end in view by the proper means, which are experience and geometry, is the characteristic of the rational man."[2] The above interpretation of Swendenborg's language is confirmed by his summary a little farther on: "By a true philosopher, we understand a man, who, by the means above treated of, is enabled to arrive at the real causes and knowledge of those things in the mechanical world which are invisible and remote from the senses; and who is afterwards capable of reasoning *a priori*, or from first principles or causes, concerning the world and its phenomena, as well in physics, chemistry, and metallurgy as in all other sciences or subjects which are under the government of mechanical principles."[3] And below he adds: "Were it possible, by such means, to bring to light the nature of the elementary, and afterwards that of the metallic, vegetable, and finally that of the animal kingdom, how great would be the advantages which the world would reap from the discovery!"[4] Today we are at the high tide of the realization of this prophecy.

Yet one thing more seemed to Swedenborg needful for his lofty enterprise. "Without the utmost devotion to the Supreme Being, no one can be a complete and truly learned philosopher." [1]

[1] Here he seems to have followed Descartes.
[2] *The Principia*, p. 32.
[3] *Ibid.*, p. 35.
[4] *Ibid.*, p. 37.

It is plain, therefore, that Swedenborg set before himself the usual scientific method of approach: (1) experiment (or "experience") to ascertain the facts; (2) inductive reasoning to discover the laws underlying the facts; and (3) deduction from the laws or principles so discovered. The only points which a scientist could call in question would be Swedenborg's *a priori* admission of the existence of the Deity, and his elevation of the Deity and the human soul above the mechanical processes of nature. But the task which our author had set himself was a bigger one than the ordinary scientific venture. It involved the entire universe; it was a philosophy. And, such being the case, he must at the very outset assume the existence of a Deity and an extra-mechanical state of being for the soul—at least as working hypotheses—or accept the alternative of a self-derived universe, give over his quest, and, if he investigated at all, confine his labors to those planes of experience directly connected with the senses.

It will, of course, be understood that the foregoing discussion applies to Swedenborg's work in that period before he claimed a more immediate contact with the interior world and entered upon his theological career.

[1] *Op. cit.*, p. 30.

SWEDENBORG AND INORGANIC EVOLUTION

SWEDENBORG'S theory of inorganic evolution presupposes an atomic hypothesis which he calls "the corpuscular philosophy" or "the bullular hypothesis." A typical bullule, as conceived by him, has the shape of a bubble, as its name implies, the surface being composed of smaller bubbles, those of bubbles still smaller, and so on, while the central space is occupied by similar particles called actives. A bullular particle is capable of three kinds of motion: (1) motion of the whole around an axis, or around two axes, and hence called *axillary* or *central* motion; (2) internal motion or *circulation* of the smaller bullules which constitute the larger; and finally (3) the *translation* of the whole corpuscle through space. Our author believed that the third motion would result from the conjoint action of the other two. According to the hypothesis, the circulation of the smaller bullules was from the center to the circumference of the larger bullule and vice versa, the particles describing in the process spirals which resulted in two vortices, a vortex of inflowing particles at one pole and a vortex of outflowing particles at the other.

Translation or locomotion of the individual particles would take place only, or mainly, when there was space in which they could operate. The bullules forming the surface of a large particle, however, or, indeed, in any contiguous volume, would be prevented from acting freely, and hence in them we would have but two motions well developed, axillary and circulatory motions. These latter particles Swedenborg calls "finites," or sometimes "passives," while the freely moving corpuscles he distinguishes as "actives." Finites and actives are, therefore, in reality identical. They are called finites when in volumes; actives when out of contact with one another and able to move in freedom.

The bullule with which we began our description, one consisting of a surface of finites and a core of actives, is properly what Swedenborg calls an elementary or atmospheric particle. When such a particle has been compressed until its actives are no longer able to move and the particle has become rigid, it is either a finite or an active—a finite if in a volume with others of its kind, an active if free.

Each of these particles—whether atmospheric, finite, or active—consists, as has been said, of still smaller bullules, and the difference between such constituent particles and the larger particle which they together form is what Swedenborg in his early writings calls a "discrete degree." Degrees are continuous when all corpuscles in a volume are of the same

size, or order; simultaneous when there are two or more discrete degrees combined into a larger or "lower" one.

It is evident that, just as smaller bullules may enter into the composition of larger ones, these in their turn may be supposed to form bullules still larger, and this process of composition might be continued indefinitely. However, Swedenborg fixed upon a certain number of stages or degrees, and this number appears to have been determined by the number of atmospheres which he believed he could recognize in the world about him. In his first speculations regarding the composition of matter he considered the water particle (*i. e.*, molecule) as his typical finite, steam being a combination of this finite with certain actives. Thus steam or "aqueous vapor" was treated as an atmosphere, an atmosphere one degree lower than the air. The existence of air is a matter of common knowledge, and an ether appears to be necessitated by the phenomena of vision. Magnetism seems to call for an atmosphere still subtler, to which our author gave the name, "magnetic aura," and at times gravitation appeared to him to call for an atmosphere more subtle than that, a "most universal aura of the world."

The same conclusions were impressed upon his mind by another course of reasoning. The air was known to be confined to the surface of the earth—

it did not reach the moon—and it evidently appealed to him as a probable supposition that there should be an atmosphere uniting the earth with its satellite, the satellite "revolving in the vortex of the earth," which formed a particular atmospheric degree. Similarly, he concluded that there was a "solar atmosphere" binding each solar system together, and this would make it necessary finally to assume still another aura, one truly "universal," with which to unite all solar systems.

Now, the number of atmospheres would necessarily help to determine the number of finites and actives. Since water particles, which entered into the surfaces of the particles of aqueous vapor, constituted the lowest degree of finites, there must be another to form the surfaces of air particles, another for the ether particles, and one each for the two auras. This would necessitate five degrees of finites. But Swedenborg thought that above all of them there must be one to form the soul of man, since man is enabled to look down upon all the rest, and this made a sixth.[1]

Perhaps the number six also appealed to him by analogy with the six days of creation. As we shall see presently, the seventh step consisted in the pro-

[1] It should be noted that, during his earlier speculations, Swedenborg associated fluids with recipient objects such as planets, and human beings in contrast with the active solar centers and the Divine Being, and hence he calls these solid corpuscles finites more often than passives.

duction of angular mineral forms on which all that had gone before and all that was to come after rested.

To unite this ladder of corpuscles with the Infinite, Swedenborg thought that there must be some entity or "*nexus*," looking in one direction to the Creator and in the other upon the created, neither entirely infinite nor entirely finite. His first finites he supposed to consist of these entities, and he likens them to mathematical points, because, while the mathematical point appears to be scarcely in existence, all geometry starts from it. This intermediate interested and perplexed him greatly and he devoted considerable attention to it both in the *Principia* and in a separate work published the same year.[1] As it arose directly from the Infinite in which all power resides, he considered it evident that it must have impressed upon itself motion of the most perfect nature, "pure and total motion," and this could not be otherwise conceived of "geometrically and rationally than as an internal state or endeavor (*conatus*) to motion."[2] Since these points entered into the composition of everything in the universe, they carried their *conatus* with them, which expressed itself first in the axillary, circulatory, and transitional motions mentioned on a previous page, later in the

[1] It appeared in an English translation as *Outlines of a Philosophical Argument on the Infinite and the Final Cause of Creation; and on the Intercourse Between the Soul and the Body*, London, 1847.
[2] Summary of the *Principia*, pp. 11, 12.

animatory motions of the heart and lungs in animal organisms, and in general in the formation of minerals, and the evolution of plants, animals, and men.

The actives of the first and second finites he supposed constituted the core of the sun, those of the third he thought had no independent existence because they would be unable to act in the same space as the first two without being changed into finites, while the actives of the fourth and fifth degrees he believed not to exist in large volumes, though they might be temporarily liberated, the first in the form of, or in connection with, lightning, and the second in ordinary combustion, "culinary fire."

Such were the organic factors, the physical and chemical units, out of which Swedenborg proposed to weave the cosmos; we now have to see how he did it. As to the first steps he is naturally not very explicit, but, as the same is true of every other cosmologist, this offers no ground for adverse criticism. He assumes that multitudes of actives of the first finite came together, forming countless solar centers, that the particles of the first aura about these were gradually constricted until they were compressed into the solid corpuscles which he calls third finites, and that these in turn, combining with actives of the first and second finites, formed the second or magnetic aura which gradually extended outward from the stellar surfaces.

"The whole visible sidereal heaven," says our au-

thor, "is a great sphere, and its suns or stars together with their vortices are parts of the sphere" connected in a manner suggested by the sphere of a magnet;[1] he adds that "the common axis of the sphere or sidereal heaven seems to be the galaxy where there is the greatest congeries of stars";[2] and suggests finally that "there may be innumerable spheres of the kind or sidereal heavens in the finite universe; these may be colligated with each other like the spheres of two magnets; and the whole visible sidereal heaven is perhaps but a point in respect to the universe".[3] We will, however, now confine ourselves to a consideration of the evolution of our own solar system, because, as Swedenborg says, the development of each may have followed an independent line. After the magnetic aura had extended for a considerable distance, the process that we observed in the case of the first aura is supposed to have been repeated. The particles nearer to the sun's surface were compressed until they also lost their atmospheric character and fourth finites came into being, forming a sheath about the solar body. But the axial motion of this sheath of finites tended to stretch it outward, at the same time reducing its thickness over all and massing the greater part of it about the equator. In time this process produced a rupture

[1] Summary of the *Principia*, trans. by Alfred H. Stroh; Bryn Athyn, Pa., 1904, p. 44.
[2] *Ibid.*, p. 45.
[3] *Ibid.*, p. 46.

at the poles and the sheath was transformed into a ring. The ring in its turn spread under the continued centrifugal action until it also broke. From the principal masses of fourth finites came the planets, from fourth finites which had fallen outward and surrounded volumes of elementary particles came the satellites, and from small quantities of fourth finites which had surrounded actives, sun spots.

Once initiated in this manner, the planets with their satellites moved outward in the vortex of the magnetic aura about the sun until each reached a point where the centrifugal and centripetal forces acting upon it were balanced, when it came to rest and continued to revolve about the solar body at that distance. In the mean time the process that had gone on upon the solar surface was repeated on the surface of our planet. The fourth finites constituting the elementary substance of our earth surrounded small volumes of first elementary particles and a new atmosphere arose, extending outward very much like vapor from the surface of a lake. Again the pressure on those particles closest to the parent body is assumed to have increased until fifth finites made their appearance, which combined with particles of both the first and second auras in the same manner as before, and still another atmosphere was formed. The first of these two terrestrial spheres Swedenborg calls the ether; the second the air. It

is to be noted that, while resembling the first two auras, or solar atmospheres, in general constitution and manner of origin, the two last differ in internal constitution, for while the auras enclose actives the ether and air enclose particles of the auras themselves. Finally air gave rise, by a similar process of compression, to the sixth finites, familiarly known to us as water, and these are constantly producing the lowest of all atmospheres, water vapor.

The first stage in the evolutionary process is now completed. The solar bodies have been brought into existence, the planetary bodies and their satellites, and the various atmospheres which bind all together. The next stage is the production of minerals. And here Swedenborg turns to an expedient similar to that to which he resorted in the creation of finites, though this time the result is a kind of devolution. In brief, he supposes the waters of the primeval ocean to have increased so much in volume and depth that the water particles near its floor broke in pieces under the strain. The more minute bullules would then filter into the spaces between the unbroken molecules of water and consolidate into angular masses of the same shapes as those interstices. Swedenborg's study of spheres placed in contact with one another led him to believe that two sorts of angular bodies would result from this process, some of them cubic and some tetrahedral. As several degrees of spherical particles were concerned,

there would be cubic and tetrahedral particles of several degrees. The cubic particles, of whatever degree, were of the class which we should now call alkalies or bases, the tetrahedral bodies furnished the acids, and the two combined, of course, would yield salts. But in this way only a part of the bases are explained. The others are supposed to have resulted from the infiltration of minute bullules into particles of water and other finites, resulting in the formation of heavy spherical bodies, which might stand alone or be combined with the angular units just described. There would thus be three kinds of units in the mineral kingdom and they would be of several degrees. In substance, this is the theory set forth in a little work which our author intended as a supplement to his *Lesser Principia*, a work which was published in an English translation as *Principles of Chemistry*.[1] It is incomplete, but from a summary of Swedenborg's philosophy written out several years later on a single manuscript page, we can fill it in in the following manner. He held, (1) that the round mineral particles from the first aura were the essential substance of gold, (2) that most of the other metals were formed by means of round mineral particles derived from the second aura, (3) that the more volatile salts arose from cubes and tetrahedrons formed between fifth finites, (4) that the more substantial salts were from cubes and

[1] London, 1847.

tetrahedrons formed between molecules of water, and (5) that from fragments of these in various sorts of combinations other minerals, oils, etc. came into existence.[1]

In the beginning the lighter minerals preponderated, particularly the salts, and these rose to the surface of the primeval ocean and solidified into a crust, a crust not absolutely solid, but with openings at various points through which water bubbled, afterwards winding its way along on the surface to disappear again underground. Upon the crust plants and animals were now brought forth in succession, and finally man. All this took place before our earth had reached its present orbit, and when it was nearer the sun, while the climate was like that of spring, before evil things had come into existence, and it was at that time and upon that crust that the Garden of Eden was brought into being and placed in charge of primitive man. The deluge which later all but destroyed mankind and put an end to the Golden Age resulted from the break up of this original mineral crust, when the oceans and continents took shape as we know them today, this explanation of the deluge being in line with the Biblical words, "and the fountains of the great deep were broken up."

The above theory, thus rapidly sketched, is of

[1] Corpuscular Philosophy in Brief, in *Scientific and Philosophical Treatises by Emanuel Swedenborg*, ed. by Alfred Henry Stroh, Part II, Fascicle 1, pp. 59-60.

course crude, at variance with known fact in many parts, and demonstrably unworkable in others. Nevertheless, for the time in which it was brought out, whether viewed from the scientific or the philosophical standpoint, it is a remarkable conception, and there is great beauty in the final scene, man in his state of integrity, in the Golden Age, the springtime of the world, surrounded by all good things, and living in idyllic happiness while his earthly abode circles near the sun much as his own mind was then nearer the Sun of Heaven.

In spite of its apparent crudeness, this mental construct contains flashes of prophetic insight in that it plainly foreshadowed the nebular hypothesis of Laplace and his successors. That it may contain further valuable suggestions was the belief of Professor Frank W. Very, whose work, entitled "An Epitome of Swedenborg's Science" is soon to be published. My main purpose in describing the theory at such length is to show that it is a true evolutionary hypothesis within the meaning of the term as already defined. The only directly creative act is in the production of the First Points, and perhaps the first finites and actives through them. And, since Swedenborg chose to carry his hypothesis rigidly back to the very beginning of things, he had only one alternative, to ascribe origins to the Creator or to adopt an avowedly atheistic position. After this everything follows in a strictly evolutionary and mechan-

ical manner.[1] Second finites and actives are formed from firsts, thirds from seconds, fourths from thirds, and so on down to sixths. And finally these finites and actives are employed in the manufacture of the substances of the mineral kingdom. Swedenborg is so rigidly mechanical throughout that the human soul is connected with one of his series of finite particles, and he would have laid himself open to a charge of materialism were it not for his exceptions as to the activities of the human soul and the Infinite.

[1] This might seem to be the very scheme of evolution which I mentioned and opposed on page 8, one which introduces the Creator only at the beginning, but, as we shall see later, Swedenborg regards his chains of finites, actives, elementaries, and organisms merely as instrumental causes, none of which ceases to maintain independent relations with the Infinite. See pages 129-130.

SWEDENBORG AND ORGANIC EVOLUTION

ON first examination, Swedenborg's treatment of the origin of organic life seems more at variance with the evolutionary theory of our day than his hypothesis of inorganic unfoldment. In order to understand his position, however, we must grasp his attitude toward the cosmos as a whole. While modern science represents evolution either as a continuous expansion along one plane or as an ascent from the inorganic to man, Swedenborg conceived of the process as dual, first a descent from the Infinite to the mineral plane, an involution of Life—the inorganic evolution which we have just described—and secondly an ascent or evolution from the mineral plane to man and through man to the Infinite. Thus, when he comes to organic evolution, the several degrees of finites, actives, and atmospheres form a kind of ladder upon which organic life may climb on its return to the Deity. It is not surprising, therefore, to find that he thinks he discovers several planes of plants and animals corresponding to the degrees already established in the elemental world.

Unfortunately, we are dependent for most of our knowledge of this part of Swedenborg's theory on

his semi-poetical work called *The Worship and Love of God*, and it is not always easy to tell how much of this he intended should be taken literally. However, we are assisted by numerous footnotes in his usual, unadorned language so that the outlines of the hypothesis are not difficult to discern. At this point Swedenborg was very much hampered by the supposedly brief time which the science and theology of his day allowed for mundane evolution. The earth, when we take the story up again, is supposed to be revolving about its sun at that distance best calculated to set the germinal forces at work in "the springtime of the world." He likens our globe at that period to a huge egg, "but one laden with as many small eggs, or small seeds, collected at its surface, as were to be of its future triple kingdom, namely, the mineral, the vegetable, and the animal." [1] Out of these first came lowly plants, such as bear flowers; later, as the soil increased in depth from the death of successive generations, came shrubs and low trees; and still later the tall trees of the forest. But Swedenborg's poetical work has it that these primitive vegetable growths were capable of producing not merely more vegetable forms like themselves but also animal forms, so that the three kinds of vegetable growths—plants, shrubs, and trees—each brought forth distinct orders of animal life. From

[1] See *The Worship and Love of God*, English translation, Boston, 1914, p. 24.

the plants came the lower living things such as worms and insects, from shrubs came birds, each species from a particular species of shrub, and from trees the four-footed animals. Land plants gave birth to land animals, and aquatic plants gave birth to shellfish, snails, fish, amphibia, and finally reptiles. Last of all man himself came into being from a tree of peculiar excellence growing in the most favored spot of the virgin planet.

It is stated specifically in others of our author's works that each degree of plants and animals contained souls, often described as of a fluid nature, derived from one of the atmospheres. Thus in the *Corpuscular Philosophy in Brief*, already quoted,[1] he says: "From these [auras] by determination are generated the fluids called spirituous: (1) the human spirituous fluid from the first aura; (2) the animal spirituous fluid from the second aura; (3) one formed from the ether, whence insects [arise]. These are the first determinants of the animal kingdom." Here and in other places the identification of the planes with the orders of animal and vegetable life seems to vary somewhat, but the principle is the same. It is to be added that each series of animals possessing a higher spirituous fluid contains as well all of the fluids below that, so that in man we have at least three. Swedenborg's *Economy of the Soul Kingdom* was written to explain the operation of

[1] See p. 23.

these fluid degrees in man, which he identified as the red blood, the white or purer blood, and the animal spirit—the last an essence widely believed in by physiologists of his period. This and the purer blood were thought to flow inside of the nerves, although at one time Swedenborg identified the white blood with the white blood corpuscles.

Such a theory of organic unfoldment can but seem grotesque to one trained in the modern doctrine and familiar with those multitudes of carefully categorized facts upon which it is based, but it is not without claims to the same name, evolution. According to it plants and animals were not created out of nothing, and animals were not created directly out of mineral substances. Note particularly that man is produced from a tree, which in its turn sprang from the mineral kingdom. Thus Swedenborg definitely broke with the orthodox belief that conjured human beings directly from "the dust of the ground."

That "witch burners" were abroad in his time as well as our own and that he was aware that he might draw their attentions to himself is shown by the following somewhat apologetic remarks on his theory of the evolution of animal life through plants:

"The command that the earth should bring forth living creatures, refers to their corporeal texture from eggs, and not to their souls, which were drawn not from the earth but from a purer or vital aura. But whether these bodies or eggs, as also those of the

water creatures, or of the winged fowl, were produced immediately from the dust or slime of the earth, or whether they grew up mediately, through the fibres of subjects of the vegetable kingdom,—it amounts to the same thing; for whether they sprang up immediately, or mediately in the way mentioned, they nevertheless came from the earth or from the dust of the earth." [1]

And he speaks thus when he touches upon the still more tender subject of the origin of man:

"Whether man was formed immediately from the earth, and thus without passing through his periods from infancy to manhood; or whether he was formed mediately from an egg and so forth, may be left to the faith of the reader. Since, however, a single day signifies an entire space of time or a lapse of many years, he might also have been born from an egg, and the egg have been produced not immediately from the earth's ground, but mediately by means of the fibres of some vegetable object or tree, whereby the essences that were to pass over into his blood might be refined. If this be the case, he was nevertheless formed out of the dust of the earth; for everything that passes through the roots or fibres of vegetables is from the earth. The fact that all things were brought forth according to ends, even intermediate ends, that were foreseen and provided

[1] *The History of Creation as Given by Moses*, English trans. by Alfred Acton; Bryn Athyn, 1911, p. 17.

for; and thus were brought forth mediately and in their orders, derogates nothing from the Divine Omnipotence."[1]

This last sentence is noteworthy, for there are admirers of Swedenborg who seem to think that to admit an origin of mankind through the medium of organisms distinctly higher than plants would "derogate" very much from the Divine Omnipotence.

But there is a more sympathetic relationship between Swedenborg's hypothesis and modern evolution than is apparent in the statement of his theory in its bald outlines. I will begin my explanation of this relationship by quoting again what our author says regarding the virgin earth as an egg about to bring forth, but adding the important sentences which follow:

> "This virgin and new-born earth, furnished with so becoming an aspect, now represented a kind of new egg, but one laden with as many small eggs, or small seeds, collected at its surface, as were to be of its future triple kingdom, namely, the mineral, the vegetable, and the animal. These seeds or beginnings lay as yet unseparated in their rudiments, one folded up in another, namely, the vegetable kingdom in the mineral kingdom, which was to be the matrix, and the animal kingdom in the vegetable kingdom, which was to serve as a nurse

[1] *The Hist. of Creation*, pp. 22-23.

> or nourisher; for each was afterwards to come forth distinctly from its covering. Thus the present contained the past, and what was to come lay concealed in each, for one thing involved another in a continual series."[1]

From the first sentence we might suppose Swedenborg assumed that the seeds of the various species of plants and animals were distinct from the beginning, but it is evident from the sentence following that this was only potentially the case. "These seeds or beginnings lay as yet *unseparated* in their rudiments, one folded up in another, namely, the vegetable kingdom in the mineral kingdom, which was to be the matrix, and the animal kingdom in the vegetable kingdom, which was to serve as a nurse or nourisher." The last part of this sentence is of peculiar importance because it helps us to understand the origin of Swedenborg's developmental theory. It is a matter of common observation that plants spring from the earth, *i. e.*, in the last analysis from the mineral kingdom, as if the earth were their mother. Poetry and myth reiterate the suggestion. It is also a matter of common observation that the vegetable kingdom is the principal sustainer, "nurse or nourisher" as Swedenborg says, of the animal kingdom. Swedenborg merely infers that the vegetable and mineral kingdoms originated *in the*

[1] *The Worship and Love of God*, pp. 24-25.

first instance from the kingdoms which are now found to sustain them. It was a natural corollary that "as many genera and species" of animal forms came forth as there were genera and species of plants, and this idea would be supported by the evident dependence of certain animals, particularly certain kinds of insects, on particular species of plants.

But perhaps Swedenborg gives us the best idea of his general conception in a footnote a little further on in the same work:

> "For all and single things in universal nature, and in each of her kingdoms, which flow determinately, perform and accomplish revolutions of this sort, that is, they commence from their first natures, and from them proceed in order to last or lowest things; and when they have there established new principles (*principia*), they return from them in a like order to first or supreme things; so that they descend, and then from newly formed beginnings ascend. This is a constant effect, not only in the vegetable kingdom but also in the animal, which kingdoms, in their most general [principles] have reference to, and resemble each other. For nature, taking her birth after an egg, and from an egg, first excited the supreme and most simple auras or atmospheres, then middle ones, and finally the last, or the aerial. These, or their individual forms or substances, which are the

most active forces of her universe, she conjoined by the mediations of the sun's rays with the principles of the earth, endowed of themselves with no activity, and thus she conceived new forms, which being enclosed in seeds were to be the most fruitful principles of new foetuses or productions. But these she hatched in an order inverted from her own, that is, she first principled those forms which were conceived from the ultimate aura, then those which were conceived from the middle aura, and lastly, those which were conceived from the supreme; by which method, as before observed, out of the earth first sprang up flowers, afterwards shrubs, lastly trees, which were prior to the rest in perfection and duration. Thus nature is said to have advanced from her first to her last, and from her last to her first, and to have performed her greatest gyration, the model of similar and lesser subsequent ones; how this greatest revolution was established is clear from the series above mentioned. That a similar progression takes place in the animal kingdom throughout, appears manifestly from those continual gyrations which prevail in bodies and produce them, both in general and in particular."[1]

In this place Swedenborg bases his doctrine of evolution on the commonest of all natural phenomena, the succession of generations in the plant and

[1] *Op. cit.*, pp. 36-37.

animal worlds. From a seed the plant develops into a complete plant, which in turn bears fruit and within the fruit seed. The seed descending to the earth begins the life process all over again. With animals the cycle is practically the same. The animal starts as a seed, usually within the body of the mother much as a seed in the earth. Then it begins a free life of its own, comes to maturity, and produces new seed within itself which initiates the life cycle once more. In a similar way, suggests Swedenborg, the whole universe has probably arisen from a cosmic germ which may be likened to an egg.

The symbol of the developing egg—used by our author repeatedly—is the same employed by Huxley in a passage noted above where he represents it as embodying the most perfect type of the evolutionary process.[1] Whatever one may think of this it certainly is not special creation. Here, for instance, Swedenborg boldly describes the origin of seeds: "These [atmospheres], or their individual forms or substances, which are the most active forces of her universe, she [*i. e.*, nature] conjoined by the mediation of the sun's rays with the principles of the earth, endowed of themselves with no activity, and thus she conceived new forms, which being enclosed in seeds were to be the most fruitful principles of new foetuses or productions." [2] Or, in other words, the

[1] See pp. 6-7.
[2] See pp. 53-54.

original vegetable germs were produced through a combination of the atmospheres—the aura, the ether, and the air—with mineral substances through the agency of the sun's rays. No originating process could be further from special creation. Swedenborg assigns a more direct function to supernatural forces in the production of animal germs, for we read a little farther on: "As the seeds of vegetables arose from the conjunction of the active powers of nature with the inert powers of the earth, through the medium of the radiation of the sun of the world, so these seeds, which are animated, arose from that form or spiritual essence, which is spiritual and living, infused into the forms or active powers of nature, through the medium of the radiation of the Sun of Life." [1] Here a spiritual essence is represented as conjoined with plants through the medium of the "Sun of Life." But this again is not a special creation, because animals came into existence *through the medium of* the vegetable kingdom. The formation of these seeds or souls—and this is of cardinal importance for our discussion—took place within pre-existing essences or organisms. The vegetable seed was formed within the mineral, and the animal seed was formed within the vegetable. In one place, indeed, we come upon a still more profound thought, and one in close harmony with modern views. Speak-

[1] *The Worship and Love of God*, p. 40.

ing of the formation of a crust over the primæval waters, as mentioned above, our author says:

"The elementary particles which came up, or emerged, from the waters to their surface and formed that crust, or dry land, could not as yet be such earthly particles as we now find in meadows, and which constitute the soil; but they were mere seeds; for the dust of our earth is born of the ashes of withered or dead grasses, plants, and trees. And therefore, since the whole surface of the earth that had now come into existence was a seminary, no other result could follow than that, from its universal bosom, it should bring forth grass, or produce the vegetable kingdom, which would afterwards serve the winged fowl and the beast for nourishment." [1]

Of course, the matter constituting this crust cannot have contained waste organic substances or humus, because there had been no vegetable or animal life to produce it. The thought would naturally follow that it must have consisted of hard mineral substances, and this would appear to us a still less tractable material from which to produce organic life. However, Swedenborg has something in mind which is entirely different. By turning back to our sketch of his theory of inorganic evolution it will be seen that he supposed the primæval crust to have been composed of elementary particles or "finites"

[1] *The History of Creation as Given by Moses, op. cit.*, p. 14.

of the fifth, fourth, and perhaps still higher degrees, released by pressure at the bottom of the ocean. We find, too, that these were very similar to the particles which entered into the animal and human fluids. In other words, they were highly generalized entities so much nearer the Source of their origin that the production of organic life from them might be much more readily conceived than from minerals such as exist today. Thus Swedenborg can speak of them as "mere seeds," and of the whole surface of the earth as a "seminary." Some of these highly generalized inorganic-organic seeds formed larger inert compounds or minerals, while others sprang up in various vegetable forms which soon gave birth to animal organisms also.[1]

Swedenborg's developmental system may be said to work at right angles with the current theory of evolution, for, according to the latter, single celled plants sprang from the inorganic world, which quickly gave rise to single celled animals, and thereafter plants and animals evolved along parallel lines; but according to Swedenborg each of the three atmospheres combined with mineral substances independently to produce a group of vegetable forms—plants, shrubs, trees—and from these in turn came

[1] Compare the "neutral stuff" of Bertrand Russell, which bridges the gap formerly created by that old sharp distinction between mind and matter ("The Analysis of Matter").

as many degrees of animals: (1) insects and worms, (2) birds, and (3) quadrupeds. Here is a strange sort of evolution, but an evolution none the less. In the last analysis plants did apparently come from minerals, and animals from plants, though we must always remember that the minerals and the plants were instrumental causes.

SWEDENBORG AND CULTURAL EVOLUTION

IN his early years Swedenborg naturally accepted the common theological opinions of his time regarding the perfection of Adam, the Garden of Eden, and the fall of man. As we have seen, he wove the literal narrative into his cosmogony, by supposing that the Garden of Eden had been located upon a crust formed over the primæval waters, and that the break-up of this crust occasioned the Noachic deluge. Like so many pious men before and since, he strove heroically to reconcile the seeming demands of nature as he knew it with the *Genesis* account of creation, and of this effort the two transitional works, *The Worship and Love of God*, and *The History of Creation as Given by Moses* are witnesses.

With the opening of the second period of his life, these views practically disappear, and the early history of man assumes a quite distinct form, which yet partakes of the theory of original perfection and a subsequent fall. Quite modern, indeed, is his admission that in the very earliest times men lived like the wild beasts, went on all fours, and were entirely devoid of religion or what we later know as culture. These beings he calls Pre-Adamites. But part of these, at least, were later elevated to the highest

spiritual level, to which he gives the name "celestial." They had immediate perception of truth and acted directly upon their perceptions; in fact they were in such close contact with the denizens of the interior world that they enjoyed direct influx from them. They communicated with each other by slight motions of the features instead of by audible utterance. They did not attempt to conceal their thoughts, and this was reflected anatomically in the fact that their faces were innervated directly from the seat of their will, *i. e.*, the cerebellum.[1] These men formed what Swedenborg calls the Most Ancient Church. Afterwards these celestial people passed through a number of stages of degeneration because they allowed their minds to be drawn away gradually by earthly and sensuous things. Thus in time, as Swedenborg describes it, heaven was "closed" to them and their descendants became utterly depraved. Degeneration proceeded so far that it was impossible to save most of them, and they perished by a kind of internal suffocation. The destruction of this Church is represented in Scripture by a flood. Afterwards came a second Church typified by Noah and his descendants, who lived in the so-called Silver Age, and these were of "a different genius." They did not *perceive* truth, but acquired it through their understandings, subsequently applying it to life. With them the path to the former will, the cerebellum, was closed, and a

[1] *Arcana Coelestia*, nn. 895, 1118, 4326.

new will took its place, seated in the cerebrum.[1] This Church also passed through several stages of degeneration, and in particular a late phase of the Church, associated with sacrifices, arose in Syria, presently giving rise to the Jewish Church, the lowest and most external of all. Just before the coming of Christ spiritual devolution was complete, but with that great event an upward movement began which has continued, though with varied acceleration, ever since.

[1] *Arcana Coelestia*, n. 4326.

VIEWS EXPRESSED BY SWEDENBORG IN HIS LATER WRITINGS

THE divergence brought out in our last chapter between the opinions on matters of human history expressed by Swedenborg in his earlier writings and those of his theological period make it advisable, before going farther, to consider whether the same divergence exists in his general theories of cosmic and organic evolution.

We may say at the outset that the majority of statements in those writings bearing upon similar subjects either refer plainly to the earlier hypotheses or may be interpreted as doing so. The divergence between the system of material unfoldment set forth in his earlier and in his later works is rather caused by omissions in the latter than by discordant assertions. There is, indeed, one apparent repudiation of an earlier principle by him which has caused some controversy. This has reference to creation through points, one of the first theses in his *Principia*.

"Many acknowledge [he says] that there is an only substance, which is also the first source of all things; but they do not know what that substance is. They believe it to be so simple that nothing can be simpler, and to be comparable to

a point without dimension, from an infinite number of which the forms of dimension were produced. This, however, is a fallacy, originating in the idea of space, from which it seems as though there was such a point; when, nevertheless, the truth is, that the simpler and purer anything is, the more full and complete it is. This is the reason why, the more interiorly any object is examined, the more wonderful, perfect, and beautiful are the things seen in it; and why the most wonderful, perfect and beautiful of all are in the first substance. This is because the first substance is from the spiritual Sun, which, as was said, is from the Lord, and in which He is; and so that Sun itself is that only substance which, as it is not in space, is all in all, and in the greatest and least things in the created universe."[1]

Later, in *The True Christian Religion* (n. 20) we read: "Unless an idea is formed of God as the primal Substance and Form, and of His Form as the absolute Human Form, the human mind may easily involve itself in spectral imaginations about God Himself, the origin of man, and the creation of the world. It would then conceive of God only as the nature of the universe in its first elements, thus as vastness, or as emptiness and nothingness; of man's origin as a fortuitous concourse of elements into

[1] *Divine Providence*, n. 6.

that form; of the creation of the world, that the origin of its substances and forms was geometrical points and their lines, which are essentially nothing, because nothing can be predicated of them. In such minds all that belongs to the Church is like Styx or Tartarean darkness."[1]

It is easy to see that an extreme adherence to the concept of an original substance composed of mathematical points would be absurd and lead nowhere, but such a conception does not seem to exhaust the thought which Swedenborg was trying to express in his early works by the mathematical point. However, I do not feel that the matter is of importance here. The question involved is highly metaphysical, and does not touch upon the problems with which we are mainly concerned.

Whatever change of view our author may have undergone with reference to the first points, it did not extend to the *conatus* or endeavor which he had attributed to them. In fact, this is treated more at length and expanded into a major principle. Regarding *conatus* in general, he says:

> "No motion can come forth without endeavor (*conatus*); so much so, that when endeavor ceases, motion ceases; wherefore, the internal of motion is endeavor, that is, moving force. So is it with

[1] Compare also *Divine Love and Wisdom*, n. 204; *Conjugial Love*, n. 329; *Divine Providence*, n. 6.

> living endeavor which is will, and living motion which is action."[1]

Conatus is also the immediate cause of organic evolution:

> "As there is an endeavor of the minerals of the earth to vegetate, so there is an endeavor of plants to vivify themselves [*i. e.*, to turn into animals]."[2]

Indeed, endeavor determines every mineral form, governs the life cycle of every plant and animal, and contains within itself the secret of the entire evolutionary process as well as the cosmos in which that process goes on.[3]

In these later writings Swedenborg commonly speaks of three atmospheres which he calls the air, the ether, and the aura,[4] but in several places a watery atmosphere is mentioned.[5] Twice, however, in both cases in the *Spiritual Diary*, he refers to four atmospheres, once only casually (n. 418), but a second time at length as follows:

> "There are four natural spheres which originate from the sun. The atmosphere which produces hearing is known. A purer atmosphere, separate

[1] *Arcana Coelestia*, n. 9473.
[2] *Divine Love and Wisdom*, n. 62. (See also nn. 61 and 65.)
[3] *Ibid.*, nn. 309-316.
[4] *Divine Love and Wisdom*, n. 192; *True Christian Religion*, n. 32; *The Divine Wisdom*, XII, 5; *The Last Judgment* (Posthumous) n. 312; *Coronis*, n. 17.
[5] *Apocalypse Revealed*, nn. 238, 290; *Conjugial Love*, n. 188; *Apocalypse Explained*, nn. 342, 538, 594, 832.

from the aerial one, is what produces sight, or visual images, by means of the reflexions of the shades of all objects: how far this atmosphere penetrates into the natural mind, and whether it presents material ideas, as they are called, or fancies and imaginations, cannot as yet be so well established, but from many things it appears probable. This, then, must be the first atmosphere which reigns in the natural mind. Another atmosphere is a still purer ether, and is that which produces the forces of magnets, which reign, not only about the magnet in particular, but also around the whole globe. . . . It produces the position therein of the whole terraqueous globe in relation to the poles of the world, and also many things which are known to the world respecting the magnetic elevations and inclinations. This [atmosphere] would seem to produce reasonings in the natural mind, with which, however, for them to live, the Spiritual must be present; as it must be with sight, and every other sense, for them to perceive. The purest ethereal sphere is that universal [sphere] in the universal world, which is presented about the reasonings of the same mind. Hence the mind is called the natural mind, and its interior operations, when perverted, are called reasonings; but, when according to order, simply reason, which is a species of the thoughts arising from spiritual influx. These spheres are of the

sun, and may be called solar, and thus natural.[1]"

To these atmospheres Swedenborg attributes the same extension. In the *Coronis*,[2] it is true, we read that the aura "proximately environs the sun," from which it might be assumed that it surrounds the sun only and does not extend to our earth, but from his statements elsewhere we know that by "proximately" he means nearest in time and degree, though, indeed, it would also be proximate to the solar body in the sense that the air and ether were not supposed to extend far from our planet, the space about the sun being occupied principally by this aura. In his posthumous work on *The Last Judgment* [3], he speaks of "the purer ether which is universal, and from which is all gravity," "the middle ether which makes a vortex about the planets, in which also is light, in which are the satellites, and from which comes magnetism; and the ultimate ether, which is the air." Here we seem to have (1) the universal aura, (2) the magnetic aura or the magnetic aura combined with the ether, and (3) the air. In *The Apocalypse Explained* [4] he says: "From the sun of the world, as from their spring, auras and atmospheres went forth, which are called ethers and airs. Thus nearest around it there is the pure ether, and further away from it, ethers less pure, and at last airs; but these two last mentioned are around the earths." This

[1] n. 222. [2] n. 17. [3] n. 312. [4] n. 726.

distribution of the atmospheres, except for a reduction in number, is still as in the *Principia*. In short, the only essential change upon this point in the theological works seems to be a combination of two in various ways in order to reduce the whole number to three.

While the bullular hypothesis does not appear under that name in connection with either the organic or the inorganic world, it is clearly introduced in Swedenborg's description of "What Man Is from Conception":[1]

> "There appeared as it were a tiny image of a brain with a delicate delineation of something like a face in front, with no appendage. This primitive form in the upper convex part was a structure of contiguous globules or spherules, and each spherule was a joining together of those more minute, and each of these in like manner of those most minute."

It is implied also in several other places, as, for instance, the following:

> "The atmospheres, which are called ethers and airs, from the highest to the lowest, or from the Sun to the Earth, are discreted into such degrees [of height]; and they stand as Simples, as Congregates of these, and as Congregates of these

[1] *Divine Love and Wisdom*, n. 432; *Divine Wisdom*, III, 4.

> again, which, taken together, are called a Composite."[1]

The next quotations reiterate the theory that inorganic substances were produced out of the atmospheres:

> "The atmospheres, which are three in both worlds . . . in their ultimates cease in substances and matters, such as are those in earths.
>
> ". . . Since in their progression downwards the atmospheres decrease, it follows that they continually become more compressed and inert, and at last, in ultimates, so compressed and inert, that they are atmospheres no longer, but substances at rest, and, in the natural world, fixed substances, such as are those in earths, which are called matters."[2]
>
> ". . . for the substances and matters of which earths consist are the ends and terminations of the atmospheres."[3]

When we look for the origins of plant and animal life, not so many references are to be noted, but those that occur almost invariably recall quotations from *The Worship and Love of God*. Note the following. On the superior nature of the animal soul:

> "That there are two general forms, the spirit-

[1] *Divine Love and Wisdom*, n. 184.
[2] *Ibid.*, n. 302.
[3] *Ibid.*, n. 310.

ual and the natural: the spiritual is such as belongs to animals, and the natural is such as belongs to plants." [1]

"The mineral kingdom is only a storehouse, in which are contained, and from which are taken, those things which compose the forms of the two other kingdoms, the animal and the vegetable. The forms of the animal kingdom, which in one word are called animals, are all according to the flux of spiritual substances and forces. . . . This animal form derives a *conatus* to such things from the first [Being or Principle], from whom all things are, who is God, as being a Man. . . . But the second form, which is the natural form, and that in which are all plants, derives its origin from the *conatus* and derivative flow of natural forces, which are the atmospheres, and are called the ethers, in which this *conatus* is present from the determination of the spiritual forces—which is into the animal form—and from the continual operation of these forces into the natural forces, which are the ethers, and through these into the matters of the Earth, of which plants are composed. That this is its origin is evident from [the fact] that a certain semblance of the animal form appears in them." [2]

"The origin of animals is spiritual affection

[1] *Apocalypse Explained*, n. 1208.
[2] *Ibid.*, n. 1208.

such as man has in his Natural; and that plants have the same origin is evident from the plants in the Heavens, in that they appear according to the affections of the angels, and also represent them, insomuch that the angels see their own affections in them . . . and also in that they are changed as the affections change; but this occurs outside of the Societies. The only difference is that the affections appear as formed into *animals by the Spiritual in its mediates, and into plants in its ultimates*, which are the earths there. For the Spiritual which is their source is alive in its mediates, but not so in its ultimates. In its ultimates the Spiritual retains no more of life than is sufficient to produce a resemblance of what is alive." [1]

On the evolution of organisms out of the inorganic world:

"The formative force . . . is the force of producing animals and plants from the ultimate matters of nature." [2]

"Ultimates are each and all things of the mineral kingdom, which are matters of various kinds from substances stony, saline, oily, mineral, metallic, superinduced with soil consisting of vegetable and animal [elements] broken up into the finest

[1] *Apocalypse Explained*, n. 1212.
[2] *Ibid.*, n. 1209.

dust. In these lie concealed the end and also the beginning of all the uses which are from life. The end of all uses is the endeavor to produce these [uses]; and the beginning is the force acting from this endeavor." [1]

"The ultimate of the Spiritual is in the Earth, in its earths and waters; and from this ultimate the Spiritual produces plants of every kind—from a tree to grass—remaining in which the Spiritual manifests itself only in a certain likeness to animals." [2]

But despite this difference the vegetable and the animal soul have the same interior origin:

"That the vegetable soul has the same origin as the soul of beasts . . . birds . . . and fishes, appears at first sight not to be the case, from the great difference that the one is alive and the other not alive; but still it is plainly evident from the animals and plants which appear together in the heavens, and also from those which appear together in the hells." [3]

A close correspondence is again noted between separate species of animals and plants.

"As there is an endeavor of the minerals of the earth towards vegetation, so there is an endeavor

[1] *Divine Love and Wisdom*, n. 65.
[2] *Apocalypse Explained*, n. 1210.
[3] *Ibid.*, n. 1212.

of the plants towards vivification; this accounts for the insects of various kinds corresponding to the odors emanating from plants. This does not arise from the heat of this world's sun, but from life operating through the heat according to the state of its recipients." [1]

The last quotation, in particular, seems a recapitulation of the system of organic unfoldment contained in *The Worship and Love of God*, and collectively the several citations show that Swedenborg's views had not changed in any important particular. Of course his somewhat literalistic explanation of the Garden of Eden is gone, but, aside from that and his problematical shift with regard to the natural point, the principal differences we notice are the more frequent use of the name of the Deity or its equivalent, the Spiritual Sun, for nature, and the expansion of the conception of the *conatus*.

[1] *Divine Love and Wisdom*, n. 62.

SWEDENBORG'S COSMOLOGY AND CURRENT BELIEFS

ON comparing Swedenborg's cosmology with current scientific beliefs, we find that the two agree in teaching that the universe as we know it has come into existence by a relatively continuous unfoldment, and that our own solar system at least owes its origin to its central body. Both view the galaxy as the core of our universe and assume that this universe is but one of many. The actuality of other universes has, indeed, been demonstrated by astronomers within the last three years.[1]

Whether Swedenborg did or did not change his views on the question of a simple primary substance, the negative position which he finally adopted is that to which scientists have come both in the biological and the physical departments of learning. When cytology and embryology were young, protoplasm, the physical basis of life, was thought to be an exceedingly simple substance, but it is now recognized as altogether the reverse. Conklin says of the cells formed from protoplasm:

"Germ cells and probably all other kinds of cells are almost incredibly complex. We know

[1] See *Science*, No. 1583, Vol. LXI (May 1, 1925), suppl., p. X.

that former students of the cell greatly underestimated its complexity and there is no reason to suppose that we have fully comprehended it. What Darwin said of the entire organism may now be said of every cell: 'An organic being is a microcosm—a little universe, formed of a host of self-propagating organisms, inconceivably minute and numerous as the stars in heaven.' "[1]

Of the physical atom Dr. Willis P. Whitney of the General Electric Company said in substance, as reported by *Science Service*, when addressing the American Chemical Society at Los Angeles in 1925:

"We have now reached a stage where the actual picture of the structure of the atom is more intricate than any earthly geometrical figure, and more perfect than any known celestial system."[2]

The doctrine of the *conatus* or, in psychological terms, the Will, has more often found a place in philosophical discussion than in scientific speculation, as in the notable case of Schopenhauer, but William McDougall has exploited it in a marked manner recently in his system of psychology. He says:

"It may be that eventually men of science will agree that there are in the universe two ultimately different kinds of process, the mechanistic and the

[1] E. G. Conklin, *"Heredity and Environment,"* 2d ed., 1916, p. 194; also see pp. 267-8. Bateson even went so far as to suggest "that at present all new forms arise only by the loss of factors or by the fractionation of factors." (See *Ibid.*, p. 404.)

[2] *Science*, Aug. 7, 1925.

purposive, the strictly determined and the creative, the physical and the mental. Or it may be that, eventually, one of these may be shown to be merely an appearance of the other, an appearance due to the present limitations of our understanding. At present we cannot decide this issue.

"But if I attempt to guess at the future development of science, I incline to follow the lead of the most powerful intellects of all ages and to predict that, if such resolution of the two types of process into one shall ever be achieved, the purposive type that we regard as the expression of mind will be found to be more real than the other." [1]

Of course, McDougall does not commit himself to all of the implications of Swedenborg's doctrine of the *conatus*, yet his views lean most decidedly in the same direction.

Swedenborg's theory of the atom agrees with the most recent discoveries in postulating two distinct elements in its composition, but instead of the bubble-like form of Swedenborg's corpuscle, the atom is now conceived as a central nucleus with bodies revolving about it like so many planets. Swedenborg's theoretical atom was modeled on the sun; that of the present day physicist and chemist resembles the entire solar system.[2]

[1] "Purposive Striving as a Fundamental Category of Psychology," in *The Scientific Monthly*, Vol. XIX, No. 3, Sept., 1924.
[2] A view already modified again by the concept of the Schrödinger atom, but the duality remains.

There is also a rough correspondence in the plan of inorganic evolution throughout. Most modern scientists hold that the minerals of our earth have resulted from condensation of gases, much as Swedenborg supposes them to have come from the compression of the atmospheres. The main difference lies in the three planes of atmospheres which the latter utilizes in the formation of his cosmos and the mineral substances of the earth. It has never occurred to any scientist to date to speculate regarding the evolution of the ether, or to suggest any atmosphere more subtle than the ether. Rather, some scientists are now inclined to doubt the reality of even that.

Turning to questions connected with organic life, we find that Swedenborg was led, perhaps through an overemphasis on *conatus*, to the adoption of the now discredited doctrine of spontaneous generation. He mentions it briefly in two places in *The Divine Love and Wisdom*,[1] and again in *The True Christian Religion*;[2] at length in the former[3] as follows:

> "It now becomes a matter of inquiry whether such things spring from eggs conveyed to the spot by means of air, or rain, or water oozing through the soil, or whether they spring from the damp and stenches themselves. That these noxious

[1] n. 342, 347.
[2] n. 470.
[3] n. 342.

animalcules and insects mentioned above are hatched from eggs which have been carried to the spot, or which have lain hidden everywhere in the ground since creation, is opposed to all observation. For worms spring forth in minute seeds, in the kernels of nuts, in wood, in stones, and even from leaves; and upon plants and in plants there are lice and grubs which are accordant with them. Of flying insects, too, there are such as appear in houses, fields, and woods, which arise in like manner in summer, with no oviform matters sufficient to account for them; also such as devour meadows and lawns, and in some hot localities fill and infest the air; besides those that swim and fly unseen in filthy waters, sour wines, and pestilential air. These facts of observation support those who say that the odors, effluvia, and exhalations emitted from plants, earths, and ponds, are what give the initiative to such things. That when they have come forth, they are afterwards propagated either by eggs or offshoots, does not disprove their immediate generation; since every living creature of the kind, along with its minute viscera, receives organs of generation and means of propagation."

This was a very old belief and a perfectly natural one. If life forms have at some time in the remote past sprung from the inorganic world, why should not the same potency exist still within it? It would

seem "natural" to assume spontaneous generation as a recurring process rather than to think of it as limited to some one period at the dawn of time. Before controlled observations were the order in science it also seemed to be confirmed by everyday experience, especially in connection with the more minute organisms. Thus it was held with practical unanimity until about twenty years before Swedenborg's birth, and was maintained by an influential school of biologists down into the nineteenth century. The spontaneous generation of very low orders of animal life is still considered possible, and claims that such spontaneous generation has been proved are put forward from time to time. However, as a doctrine of any but the most limited application, it has been abandoned since the famous experiments of Pasteur in the middle of the last century. One may add that it is not in the least essential to Swedenborg's general hypothesis, to which it bears somewhat the relation of a fifth wheel, and when we examine his hypothesis relative to the circumstances under which the first life forms came to appear upon our planet, we find a distinctly modern suggestion. He assumes that this happened at a certain critical time in the world's history when our globe circled nearer the sun than it does today, and when its climate resembled "a perpetual spring." Or, in other words, just as life in the animal and vegetable kingdoms revives at a particular time each year which we call spring, so

there was a corresponding time in mundane history in which they first appeared. This is in general accord with some modern views. In order to account for the appearance of life at one definite time in the past, coupled with failure to detect evidence of such a process at the present day, it has been suggested that this critical period occurred when our sun was hotter than at present, when, instead of being a star of the yellow class as now, it belonged to the blue or the white class, and solar energy was proportionately more efficient. This view has been developed with an eye to the remarkable effects on life now known to be exercised by the rays at the violet end of the spectrum.

In bringing life from highly generalized particles which had not yet taken upon themselves distinctive inorganic properties, Swedenborg applies a law accepted by all evolutionists, that the generalized precedes the specialized, but he shows a flash of genius in introducing it in a situation where, until recently, it seems to have occurred to no one else to place it.

Swedenborg and modern thinkers are naturally in harmony in assuming that plants came before animals, since animal life as we know it today cannot be supported apart from plant life, and while this may not be true of the most minute organisms, it is agreed that, if either of the two organic kingdoms originated first, it must have been the kingdom of plants. There is also rough agreement in the idea that the lower

forms of organic life took precedence of the higher ones, but Swedenborg was under the illusion that the smaller forms were the more primitive, and thus he places flowering plants at the very bottom of the series. In his arrangement of animals with insects and worms at the lowest level, followed by birds and then by mammals, he is more nearly correct.

Perhaps few passages in our author's writings have created more perplexity in the minds of students of Swedenborg than the following from *The True Christian Religion*,[1] in which the well known fact of sexuality in plants seems to be flatly denied.[2] It runs in part thus:

> "In trees and all other subjects of the vegetable kingdom, there are not two sexes . . . but every one of them is male; the earth, or soil alone, being the common mother, and thus as the woman; for it receives the seeds of all plants, opens them, gestates them, as in the womb, and then nourishes them; and it brings them forth . . . and afterwards clothes them, and supports them. . . . Lest anyone should wonder . . . that the subjects of the vegetable kingdom are only male . . . [take] bees . . . as there is only one common mother for these . . . why not for all plants? That the earth is a common mother may also be

[1] n. 585.

[2] A discussion of this question is to be found in the *New-Church Review*, vol. XXIX, No. 2 (April, 1922), pp. 186-196; No. 4 (Oct., 1922), pp. 420-429.

illustrated spiritually, and it is so by the fact that the earth in the Word signifies the Church, and the Church is a common mother, as she is also called in the Word."

But how would Swedenborg reconcile this assertion with the following quotations from other of his works?

"A relation to man arising out of each and all things of the vegetable kingdom is evident from this: they spring forth from seed, and thereafter proceed step by step through their periods of growth; *they have what is akin to marriage*, followed by prolification; their vegetative soul is use, and they are forms thereof; besides many other particulars which have relation to man." [1]

"That this conjugial sphere fills the universe, and pervades all things from first to last, is evident from what has been shown above, that there are marriages in the heavens, and the most perfect in the third or supreme heaven; and that besides having place with men it has place also with all subjects of the animal kingdom in the earths, even to worms; and moreover *with all subjects of the vegetable kingdom*, from olives and palm-trees even down to the smallest grasses." [2]

This inconsistency may probably be explained as

[1] *Divine Love and Wisdom*, n. 61.
[2] *Conjugial Love*, n. 222.

follows. The correspondence of each object in nature varies, though only in appearance, according to its association, and when Swedenborg has a certain association in mind he is apt, for the moment, to lose sight of other associations. Therefore, just as writers are guilty of mixed metaphors, he has here, I think, been guilty of a mixed correspondence and has attempted to interpret the facts to agree with his error. Earth does have a general feminine correspondence when coupled with the sun, as Swedenborg himself tells us in *The True Christian Religion*.[1] "The sun is as a common father, and the earth as a common mother, from whose marriage comes forth all the vegetation which adorns the surface of the Earth." It also has a feminine significance from its correspondence to the Church, as in the passage in the same work [2] above quoted, when it is placed over against the Sun of the spiritual world. Plants, on the other hand, derive an association with the male element from their general correspondence to truths,[3] while animals derive an association with the female element from their correspondence to the affections.[4] In bringing mother earth and plants together in the famous passage in *The True Christian Religion*, Swedenborg has thus juxtaposed two unrelated halves.

Although it was plain to him that plants had come from the mineral world and animals from plants,

[1] n. 308. [2] n. 585 [3] *Apocalypse Explained*, nn. 340, 724.
[4] *Heaven and Hell*, n. 110; *Apocalypse Explained*, n. 582.

Swedenborg entirely failed to realize the enormous length of time needed for the process, and he assumes that the potencies in the mineral kingdom produced at once the various species of plants and that the potencies in the vegetable kingdom gave rise similarly to the various already differentiated species of animals.

When we come to man himself, we are confronted by a belief which most biologists would be certain to characterize as an unwarranted assumption, *viz.*, the idea that tendencies inherited through the father are more deeply seated than those derived from the mother. Indeed, Swedenborg repeatedly strengthens the assertion by saying that the soul of a human being is from his father and his body from his mother, and this belief plays a vital part in his doctrine of the Incarnation.[1] Were it not for the last mentioned fact, this might seem to be a naïve opinion based on nothing better than superficial appearances, yet it is partially supported by our latter-day knowledge. When fertilization takes place, not much of the male cell enters into the process except the nucleus, nearly all of the extra-nuclear or cytoplasmic material being from the mother, though in subsequent cell divisions this is modified by chromosomal material from both parents. Guyer says:

"It is probable . . . that instead of asserting

[1] *Arcana Coelestia*, nn. 1815, 3518; *Divine Love and Wisdom*, n. 269; *Divine Providence*, n. 277; *True Christian Religion*, nn. 103, 112.

that the entire quota of characters which go to make up a complete individual are inherited from each parent equally, we are justified only in maintaining that this equality is restricted to those measurable differences which veneer or top off, as it were, the individual. We may infer that in the development of the new being the chromosomes of the egg together with those derived from the male work jointly on or with the other germinal contents, which are mostly cytoplasmic materials of maternal origin." [1]

Here we have recognized the greater share of the mother in the production of the original *body* cells. The chromosomal contributions of each parent appear to be equal, but one distinctive difference is due to the male, the difference of sex, and the fundamental importance of this is now known to be much greater than had been supposed. [2]

In comparing the early man of Swedenborg with the early man of science we must first disabuse ourselves of a fallacy, only too common in discussions of primitive people, to the effect that spiritual and cultural elevation are synonymous. Students who have maintained the thesis of human degeneration

[1] Michael F. Guyer, "Being Well Born," quoted in *Evolution, Genetics and Eugenics*, by Horatio Hackett Newman, The University of Chicago Press, 1925, p. 339. See also the Sci. Month., X, pp. 388-392.
[2] See the experiments of Satina and Blakeslee in *Proceedings of the National Academy of Sciences*, Vol. 12, No. 3, pp. 191-207; Vol. 13, No. 3, pp. 115-122.

have sought to find confirmation of their views in remains of extinct civilizations. But archeology has shown that, from the cultural standpoint, man has maintained, upon the whole, a pretty steady advance. There have been no serious setbacks, although temporary reversions have taken place, as on the decline of Greek civilization, on the fall of Rome, and on the destruction of Saracenic civilization by the Mongols and the Spaniards. On the other hand, even within historic times, there has been an ebb and flow of the spiritual element. This is illustrated by the flowering and fading of Greek art and the art of the Renaissance, by that wave of religious enthusiasm to which the cathedrals of northern France owe their existence and that which followed the preaching of St. Francis of Assisi.

Still less is it to be supposed that newly created man entered at once into a knowledge of the arts and sciences of a complicated civilization. Even his spirituality is to be compared with that of the child, whose culture is crude and must be developed and trained along with all of his other latent powers.

Swedenborg does, indeed, seem to lend some support to the theory of an early culture of high order by speaking as if the Most Ancients kept flocks and herds and cultivated the ground.[1] This would bring them down into, or identify them with, the New Stone Age, and would either indicate an almost in-

[1] *Arcana Coelestia*, n. 1002; *Apocalypse Explained*, n. 799.

credible extension of the period covered by the Most Ancient Church or leave an equally incredible gap between the appearance of man and the institution of the first Church upon earth. It is safer to conclude, either that Swedenborg here speaks of past times in general terms or that, being ignorant of those vast aeons during which men had lived upon our planet and the economic conditions prevailing among them, he pictured conditions as he supposed they must have been from the knowledge then available to him.[1]

Aside from all questions of civilization, however, Swedenborg presents us with a serious problem, because he certainly represents primitive men of the Most Ancient period as enjoying a moral elevation unlike anything experienced by their successors down to the present day. Whereas modernist theology aligns itself with modern science in regarding ethical status as a thing subject to progressive evolution, Swedenborg agrees with the earlier theology in figuring two great moral maxima in human history, one at or near the very beginning and the other in the indefinite future, and a moral minimum falling near and being the occasion of the birth of Christ. Nevertheless, even though at present out of favor, Swedenborg's position is not devoid of support on scientific grounds, as I will endeavor to show.

[1] However, he refers to people who were *as if* of the Most Ancient Church living at a much later period.

Whether it is due to a merciless weeding out of individuals who make errors of judgment, or, as I rather believe, to the perfect adjustment of their mental and physical machinery, animals do not abuse themselves in the manner so patent in the case of human beings. They are machines perfectly attuned to their environment and in a state of internal order, and with such an efficient equipment man must have begun his life as man. If, now, we accept the view which seems to be supported by appearances that man possesses the power of acting against nature, *i. e.*, of disturbing his own physical and mental, not to add moral, well being, we may very well suppose that a period of order, in consonance with natural laws, was followed after a time by a period of disorder because man chose to act contrary to natural laws. So far we may make this as a purely scientific supposition. But if man, besides having a natural plane in direct contact with the material environment, has more interior planes in contact with a spiritual environment, what condition would these planes be in during the period before he had introduced disorder by the abuse of choice? This is a problem not merely for Swedenborg or Swedenborgians but for everyone who holds to the doctrine of the immortality of the soul. If the man-animal were in perfect order and if he possessed an immortal part living in contact with an interior universe, would he remain entirely unconscious of it? Would

it be possible to withhold man from a knowledge of it when he was undefiled by anything that could be called sin? Swedenborg answers, No! As the course of religious history is unfolded by him, the God of Love did not withhold from His creature the use of every faculty which he possessed, even though aware that the final control of these faculties could not be attained until after long wanderings and manifold experience. And the time during which the use of the interior faculties was enjoyed, before abuse of choice had made it necessary to close them, was the period of the "Most Ancient Church."

Returning to purely scientific considerations, we find two rather marked points of agreement between primitive man as depicted by Swedenborg and primitive man as disclosed by science. The first of these is the greater *relative* development of the cerebellar region among the Most Ancients than with their successors, for it is a well known fact that it is the frontal region which has shown the greatest evolution in man in recent times. What Swedenborg says regarding the innervation of the cerebellum is too general to discuss either way. He might at first seem astray in locating the will in this organ, since we associate will with volition and it is generally recognized that the function of the cerebellum is to co-ordinate the movements of the body and preserve all parts in balance. We must remember, however, that, according to the theory, this organ was identi-

fied with the will at a time when both action and reaction were so orderly as to be nearly instinctive. The flow of action may then very well have been closely bound up with the functions of the cerebellum.

The second point concerns that revolutionary change which Swedenborg indicates at the end of the Most Ancient period. This seems to correspond very markedly to a change in human types which took place at the beginning of the Upper Paleolithic period (about 20,000 or 25,000 B. C.): the disappearance of Mousterian or Neanderthal man and his replacement by the true *Homo sapiens*, the man whom we know today.[1] Up to the present time this change in type is one of the great mysteries of Old World archeology. It has been supposed that the Mousterians were driven from Europe or exterminated by more advanced races coming from the east, but we have found Mousterian remains, as noted above, over much of Asia and Africa, and the center from which their successors spread has so far escaped us.

The Mousterians might, at first, be thought to correspond to Swedenborg's Pre-Adamites on account of their bestial appearance, but such a conclusion seems to be precluded by the fact that they gave their dead regular burial and even placed food in the grave, showing that they had some form of religious belief, whereas the Pre-Adamites antedated

[1] See p. 28.

the institution of any kind of religion. It must then follow that the Mousterian people formed the last and most degenerate phase of the Most Ancient Church, and this their physical type would suggest. It is significant that most anthropologists do not believe that the species from which we are descended could have arisen from this race. Evolution in their case seems to have taken a different direction and to have reached a point where survival was impossible. But we need not envelop their destruction in mystery. When Swedenborg speaks of a kind of internal suffocation, he is giving us the spiritual aspect of the case. Exteriorly their end may have taken the form of pestilence, inability to compete with other peoples, or the subtle cause which Dr. Rivers indicated when he wrote: "When . . . the indigenous culture is threatened by a dominant alien culture, it may happen that the tribe loses the will to live and so becomes extinct." [1]

The development of the "Most Ancient Church" might, therefore, be assigned to that immense space of time covered by the Pliocene Period, possibly extending back into the latter part of the Miocene. The later phases of it would be represented by the early stages of the Old Stone Age, the Pre-Chellean, Chellean, Acheulian, and Mousterian, its extinction by the disappearance of the Neanderthal race at the end of the last-mentioned period, and the institution

[1] Quoted by L. H. Dudley Buxton, in *Primitive Labour*, p. 259.

of the new Church, the "Ancient Church" so-called, with the Upper Paleolithic Age, corresponding therefore with the highly artistic periods known as Aurignacian, Solutrean, and Magdalenian, continuing through the Neolithic Age, down into the Age of Bronze and the time of recorded history. Upon the whole this identification seems to be fairly satisfactory, and to answer most of the important questions raised by Swedenborg's statements regarding primitive man.

A first reading of our author's speculations will hardly create enthusiasm in their favor on the part of one who compares them mentally with the conception which nearly two hundred years of subsequent scientific achievement have given us. His naïve mathematics, the postulation of unproven auras, the mineral crust over the primeval ocean with its Garden of Eden perched atop ready to be engulfed with the shattering of the shell upon which it rests, the production of animals and men from full-grown plants, the sudden burst into existence of organic life in all its variety, classification of plants rather according to their size than their real biological differences, early man of a celestial genius communicating directly with angels and destroyed by "internal suffocation"—these things, coupled with such discarded hypotheses as spontaneous generation and the unisexuality of plants, must of neces-

sity create anything but a favorable impression.

However, if, undeterred by superficialities, we seek carefully for the underlying principles which our author had grasped and was striving to express through the medium of the limited science of his day, we shall discover reasons for estimating his attainments more highly.

In the first place, it must be remembered that, prior to the publication of Sir Charles Lyell's *Principles of Geology* in 1830-33, few dreamed of the vast extent of time over which the history of our earth was spread. Theology and such science as existed assured would-be investigators that it had been confined within some six thousand years, and it was therefore not surprising that speculators on the origin of the cosmos should feel it necessary to syncopate the process as much as possible. This one fact is responsible by itself for a large proportion of the crudenesses which we find in the works of Swedenborg and his contemporaries.

We note next that our author rarely adopted a hypothesis without having some sort of scientific basis for it. His atomic theory was founded on his studies of the behavior of water, air, light, and metals. He postulated three or four atmospheres in order to account for the phenomena of sound, light, electricity, magnetism, and gravitation, and afterwards he made the most economical use of them by striving to explain by their means the organization of

the three kingdoms of nature, without introducing more mysterious entities, for his actives and finites are constituent parts of the atmospheres. He argues, logically, that the matter composing all of these spheres would probably enter into and affect the mineral, vegetable, and animal worlds bathed by them. He evolves plants from minerals because all about us we seem to see plants growing out of minerals, and he evolves animals from plants because animal life requires vegetable life for its support. In its broad outlines the course of human history described by him is made necessary if we admit the existence of evil or disorder and believe in human freedom. It is noticeable that, unlike many speculators of his time, he does not deal in the marvelous and introduces the supernatural only as an efficient force behind inorganic process and organic life, though even here he supposes it to produce its effects by means of purely natural media. When he adopts wrong theories and comes to wrong conclusions it is usually *because certain bodies of evidence pointed in that direction.* He rarely flies deliberately in the face of such evidence—his seemingly dogmatic position on the question of sexuality in plants is one of the very few exceptions to this rule, and the reason for it I believe I have satisfactorily explained. To flout well accredited facts was, indeed, contrary to his own methodological principles.

Thirdly, our latter day knowledge indicates that

Swedenborg was right, or in large measure justified, in holding the following views:

1. That the cosmos originated from complex instead of from simple entities.
2. That generalized forms preceded specialized forms, and that this law includes the inorganic as well as the organic.
3. That the universe and each solar system in it came into existence through a gradual unfoldment in accordance with natural laws.
4. That there are numerous stellar universes.
5. That the galaxy is the principal axis of our own particular universe.
6. That our solar system had its origin in the sun.
7. That the matter of our planet was condensed out of the atmospheres.
8. That the atom is composed of two primary elements.
9. That organic life came into existence on our globe at a critical period in the remote past when the effect of the solar rays upon its surface was greater.
10. That plants originated from minerals; or that both originated from a generalized predecessor.
11. That animals came into existence from plants, or by means of them.

12. That lower forms of plants came first and were followed by higher ones; and that the same was true of animals. (Though Swedenborg classified lower and higher plants erroneously, he was right in principle.)
13. That man once lived like the wild animals and was scarcely distinguishable from them.
14. That man's state before he abused his selective faculties must have been different from what it became subsequently.
15. That the evolution of man was accompanied by a relatively greater development of the frontal region in the brain.
16. That the earliest type of man was almost entirely swept away. (To archeologists this means the substitution of *Homo sapiens* for *Homo neanderthalensis*.)
17. That evolutionary processes are guided by a *conatus*, endeavor or urge.

The last of these is, of course, not an accepted scientific principle; but it has been rendered familiar to scientists through its use by Lamarck, McDougall, Osborn, and other prominent thinkers. The identification made in Number 16 is purely circumstantial, and some of the other points made involve only general resemblances. But even so the showing is an impressive one.

THE INADEQUACY OF PRESENT EVOLUTIONARY THEORIES

IN an earlier chapter I have described the main features of the two principal schools of evolution which take their names from Darwin and Lamarck respectively.

The key factors in the Darwinian theory are two: "accidental variations," and "natural selection." The "struggle for existence" and the "survival of the fittest" are implicit in these and are less exactly scientific in their connotations, particularly the former, which involves a distinct projection of human psychology into fields where its existence is to be proved, not taken for granted.

The name, "accidental variations," or "chance variations" is misleading and has been the occasion of much misunderstanding of evolution and by far the larger part of the more intelligent opposition to it. This is because "accidental" and "chance" are both accepted by the ordinary reader with their common meaning as of that which is haphazard. And unfortunately this is still done by many superficial thinkers, especially those of a sceptical bent, and by many scientists who should know better. Darwin, however, was fully aware of the special interpretation

which must be placed upon the adjective in this connection. He says: "I have hitherto sometimes spoken as if the variations . . . were due to chance. This, of course, is a wholly incorrect expression, but it serves to acknowledge plainly our ignorance of the cause of each variation." [1]

The opposing theories of accidental or "fortuitous," and purposive production have, indeed, played a great part in the history of human thought, and it is not surprising that they should intrude themselves into science where science borders upon philosophy. Origin through chance was first suggested by Empedocles (495-435 B. C.) and the proposition was greatly elaborated by Democritus (451-? B. C.), by whom it was passed on to Epicurus (341-270 B. C.) and Lucretius (98-55 B. C.). With the revival of learning it reappeared, and was accepted consciously or subconsciously by very many students of the eighteenth and nineteenth centuries. The opposing theory of design is traced to Anaxagoras (500-428 B. C.) but found its greatest exponents in Plato and Aristotle and naturally was in the ascendancy throughout the period of church domination. With the revival of learning it suffered from the reaction against scholasticism, and until very lately was upheld by few scientists, though it is maintained today by such a representative evolutionist as Osborn.

[1] Darwin, *The Origin of Species*, New York, 1889, vol. I, p. 164.

The weakness of the doctrine of chance as applied to origins is not so much on the theoretical side as in the fact that it is opposed to scientific experience. Exploration of all departments of nature has demonstrated the universal reign of law. So true is this that investigation is pursued with the distinct assurance that, however widely certain facts vary from the expected, further experiment will ultimately disclose laws governing them. No one would be more astonished than a scientist to come upon a fact unrelated to any other fact. That would, indeed, be a true miracle. Upholders of the doctrine of chance are wont to assume, if not to maintain, that natural law is supreme *until* we come to ultimate origins and that these are under the rule of chance, but, in the absence of any proof to that effect, such a belief becomes a mere dogma. Of course law need not be interpreted as proof of design. The mechanist is still at liberty to admit the reign of law but deny the Law-giver. Here we touch upon interpretation, in other words on philosophy.

With reference to the principle of "accidental variations," this general inference is now strengthened by the discovery of the Mendelian laws and the accompanying proof that some variations, at least, are not accidental in any sense of the term. Yet two classes of changes remain, those called by Conklin "fluctuations" and "mutations," [1] to which the

[1] E. G. Conklin, "The Mechanism of Evolution" (The Scientific Monthly, X, 1920), p. 589.

name might still apply, though, as has been shown, in a purely technical way.

It does not appear to have been recognized that the special interpretation of "accidental variations" above given must have a profound effect upon our understanding of the second factor, "natural selection." This expression, like "the struggle for exisence," is in the first place open to the charge that it carries anthropopathic connotations, since it suggests conscious choice on the part of nature, which no selectionist would actually admit. Secondly, Mendelian changes are known to be in accordance with certain laws, and the reign of law in nature is so universal that the burden of proof is on him who would deny it even to the particular associations of genes and chromosomes which occur, however far we may be from a knowledge of the laws governing those associations. The same is true of fluctuations and mutations. The variations presented to nature, or the environment, for its "selection" are therefore already determined in particular directions. On the other hand, in accordance with the same reasoning, the environment by which the selection is "performed" is itself determined by law, and that determination will also affect the result in definite directions.

It has been a favorite sport of selectionists to play organisms and environment off against each other, and even though admitting that one or the other is

governed by law, or perhaps that each is governed by law separately, accept the doctrine of chance as between the two. But the rule of law—I am not now speaking of design—is inexorable and universal. If the variations entering into an organism are under law, as we have just shown to be the case, no less are the factors in its environment, and no less, however hard it may be for us to realize it, the contact between organism and environment at any given time. The circumstance that such factors and such contacts have the appearance of chance, and that in the forms of everyday speech we so designate them, should not obscure the truth that law is universal.

But indeed recent investigations have shaken scientific belief in the efficacy of natural selection on purely observational grounds. In his presidential address before the American Association for the Advancement of Science in 1923, Professor J. Playfair McMurrich of the University of Toronto said:

> "[Natural selection] plays an important role in the suppression of the unfit rather than in the survival of the fittest, but it can act only on variations sufficiently pronounced to determine life or death. It has been shown in several cases that what seem trivial variations may, under certain conditions, lead to fatal results, but even admitting these, it is difficult to believe that many of the minute differences that distinguish species have

selective value. Natural selection acts effectively in the perpetuation of species, but it does not originate them, and to that extent the modern biologist may depart from Darwin's standpoint." [1]

Prof. A. G. Tansley, in his presidential address before the Botanical Section of the British Association for the Advancement of Science the same year, concludes that "it is not only unproved, it is a gratuitous belief unsupported by the evidence, that all new characters, all differences between species, are of survival value or owe their origin in any way to selection." [2]

In discussing "The Fact, the Course and the Causes of Organic Evolution" as one of the statements prepared for the defense counsel in the famous Scopes case, Dr. Winterton C. Curtis, Professor of Zoology in the University of Missouri, says:

"Of recent years, this theory of the causes of evolution has suffered a decline. No other hypothesis, however, has completely displaced it. It remains the most satisfactory explanation of the origin of adaptations, although its all-sufficiency is no longer accepted. The initial step in evolution is the *appearance* of individual variations which are perpetuated by heredity, rather than the

[1] *Science*, vol. LVIII, No. 1513 (Dec. 28, 1923), p. 527.
[2] "Some Aspects of the Present Position of Botany"; Report of the 91st (Liverpool) Meeting of the B. A. A. S., held in 1923, p. 250.

selection of variations after they have appeared. The interest of investigators has shifted to problems of variation and heredity, as exemplified by the rise of the science of genetics." [1]

There exists, has always existed, and will always exist an adjustment between an organism and its environment. At times the environment is a means of modifying the organism, and at times of destroying it, and we may, if we choose, call one or both of these processes natural selection; but we may not, as scientists, affirm them to stand apart from law or partake of the accidental. The thought that life presents an indefinite number of experiments for the chance approval or disapproval of environment appears to be guardedly scientific, but it must be modified at both ends. For, as we have already shown, life does not present an indefinite number of chance variations and environment does not act upon them in a chance manner. In short, natural selection is a very different thing from what it professes to be, and its actual function is probably exceedingly limited.

The Lamarckian form of evolution has one great advantage over its rival in that, instead of burying the problem under such a misleading term as "accidental variations," it attempts a real explanation of change. That alteration in environment should

[1] *The Scientific Monthly*, vol. XXI, No. 3 (Sept., 1925), p. 298.

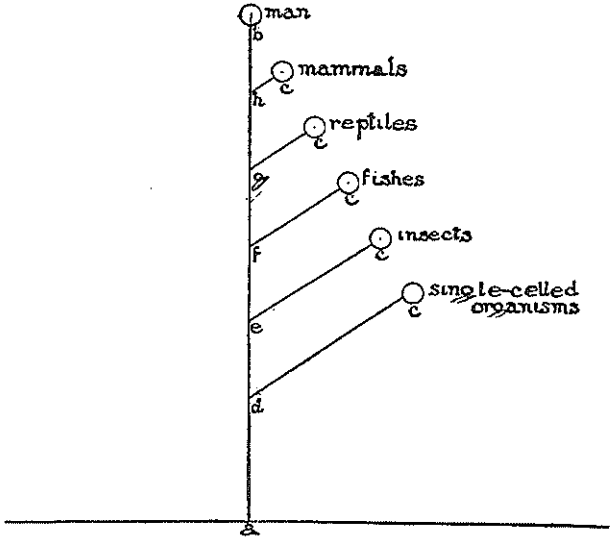
cause alteration in habits, and that these should be reflected in the development or disappearance of organs or parts of organs is an appealing suggestion. If the reality of this process could be demonstrated, it would reinforce the views of those philosophers who see in life the expression of Will, for although no Lamarckian supposes organs to be directly willed into or out of existence, the use and disuse which produces or eliminates them depends directly upon the action of will. This would be in line with the position of McDougall—although he objects to the use of the term Will, preferring to speak of conation—and also with Swedenborg's theory of the *conatus* animating all three kingdoms of nature. The apparent failure of all attempts hitherto made to show conclusively that acquired characters are inherited is the greatest handicap to the acceptance of Lamarckism, but it is possible that further investigations may modify to some extent the negative results so far obtained, and there is some ground for the suspicion that a dash of Brahmanism enters into the Neo-Darwinian opposition. It is unquestionably fortunate, we must admit, that inheritance cannot be too readily influenced by the bearers of germ cells. In view of the chaos into which men have chosen to plunge contemporary world affairs, it should probably be occasion for prayerful thanksgiving that their power over future generations is in some measure limited. Yet it seems repugnant to

common sense to assume that organisms can be bathed in an environment for a long period and the stock fail to be affected by it. We know that mutations have taken place from time to time when least expected, and perhaps it may turn out that these are the result of cumulative influences working in from the environment.[1]

But, as matters stand at the present time, the Darwinian theory has proved to be seriously defective, and the Lamarckian theory has failed to establish its major premise. These facts have no bearing whatever on the truth of evolution itself, any more than the truth or falsity of the undulatory or the corpuscular theory of light affects the existence of light. Proof of the existence of light is overwhelming; proof of the existence of evolution is also overwhelming. Besides the fact of evolution, scientists would agree that the courses of the main phyla of plants and animals into which the evolutionary stream divided are fairly clear, and that they are becoming clearer every day. They would in the main agree that the increments of change by which evolution takes place differ in extent, being sometimes very minute and sometimes so considerable in amount as to receive the name of "leaps" or "saltations." They would furthermore agree that evolution proceeds from generalized to specialized forms—an im-

[1] For the altered status of Lamarckism as a result of recent experiments see footnote on page 21.

portant point which superficial students of the subject, especially opponents of the evolutionary theory, constantly miss. The following highly conventionalized diagram will illustrate this:



Here the various classes of living animals, or rather various types of the classes of living animals, are represented by the circles *c, c, c, c, c,* with man at *b*. The vertical line *a-b* represents the main line of evolution, and the lines extending from this to *c, c, c, c, c* the lines of evolution of each of the classes of animals represented, single-celled organisms, insects, fishes, reptiles, and mammals. The line *h-b*

represents the path of man's own evolution after his ancestry became separated from that of the rest of the mammals. It will be seen, therefore, that the course of evolution was not directly through *c, c, c, c, c,* to *b*, but that each group of animals is related indirectly through common ancestors, generalized forms occupying positions along *a-b*. Thus we have to go to *d* and below for common ancestors of single-celled organisms and the other animal forms, to *e* and below for common ancestors of insects and higher forms, and so on. Of course the actual evolutionary tree is much more complicated, and just where on the main stem each branch came off is a matter of great uncertainty. However, that does not now concern us.

What Neo-Darwinians and Neo-Lamarckians have alike failed to show is the cause of the operation itself. The Neo-Darwinian must admit that his system cannot operate without chance variations or mutations, and he cannot explain them. Some few selectionists seem to believe that by exposing a cell of protoplasm to different degrees of heat and humidity, or to different kinds of radiation, they can hatch whatever may be demanded, and in this they show a child-like faith which a special creationist might well envy them, but their confidence is not widely shared. Nor could Neo-Lamarckians, even though the inheritance of acquired characters were shown to be a fact, explain the existence of the will,

or its reason for climbing the evolutionary stepladder. As a rule, adherents of both schools have failed to distinguish origins, which are a proper subject of scientific investigation, from causes, which really belong in the realm of philosophy. Osborn, one of the few who perceive this distinction clearly, says:

> "The *causes* of these origins is quite another matter. Some day we may be able to work out the separate contribution of each of the four energetic factors, heredity, environment, ontogeny, biota[1] to germinal evolution. We paleontologists observe exactly how the process of germinal evolution of bio-mechanical characters goes on, adaptive in every stage, just as the embryologists observe how the process of adaptive development goes on whereby the invisible germ turns gradually into the adult and perfected skeleton and teeth. There is no accident in either mode of transformation, evolutionary or developmental, nor is there anything that we can comprehend. On the whole, the order of evolution imitates the order of development; both processes, to our mind, are equally inexplicable, and will probably remain so." [2]

[1] By "biota" Osborn means that part of the environment constituted by *living* things.

[2] Address before the National Academy of Sciences, Washington, April 28, 1925; printed in *Nature*, June 20, 1925.

THE CAUSE OF EVOLUTION

AT this point the direction of our argument will be altered. We have given a sketch of general evolutionary theory, or rather evolutionary theories, and a sketch of the parallel development hypothesis elaborated by Swedenborg; we have noted the strong and the weak points in the latter; and we have summarized those conclusions which seem to be in harmony with later investigation and to be of the most fundmental importance. But in touching upon the will or *conatus* we have reached—or perhaps reached somewhat beyond—the bounds of science as ordinarily conceived, and so long as Osborn confines himself to his biological and paleontological data he is quite right in drawing a sharp line between origins and causes and in declaring that the latter are "inexplicable."

Within the domain of the recognized sciences, however, it not infrequently happens that when one science is unable to carry investigation farther, another may take up the burden, and in the process of doing so introduce corrections into the work of its sister science. Thus, before the radioactivity of elements had been discovered, science would have been utterly misled by physicists regarding the age of our earth and solar system if it had not been for the

corrective influence exerted by geology. It is evident that we must do something of the same kind here, or stop short.

The natural sciences having admitted their inability to proceed farther in pursuit of the causes of evolution, the humanistic sciences, or those dealing more particularly with man, seem to be our only recourse. Here, after mineral, plant, and animal have failed us, we find testimony regarding the existence of the object of our pursuit, the world of cause, in human minds. Nearly all known peoples have these two distinctive prepossessions: belief in a superior or interior world into which they expect to go at death, and which they usually think of as surrounding them in the present, and belief in a superior Being or Deity. Although this latter is generally pluralized among relatively backward peoples, it will simplify the discussion if we use the one term for the general idea of superior powers. Forgetting our philosophies for a moment, let us from our own experience, assisted by our newly acquired knowledge of the unsophisticated races of mankind, attempt to evaluate these spontaneous conceptions.

We are conscious of a world of matter and motion outside of ourselves and a world of thought and feeling within. Association with our fellow men gives us every reason to assume that in this particular their experience is identical with ours. Both subjectively and objectively we differentiate between the

two worlds. We assume that they are separable from the discordance between our internal selves and our environment, and from the apparent separation which we observe to take place at death. This dualism is an almost instinctive interpretation of the facts. The two other interpretations: that mind is a function of matter (materialism) or that matter is a function of mind (subjective idealism), come with a later stage of sophistication, and neither of them allows for a world of causes distinct from a world of effects. We may contend that this instinctive dualism is mere delusion, but if so, how do we account for it? A momentary error of judgment is comprehensible; not so a continuing error of the kind we are discussing, unless indeed there is behind it a reality.

Man is also conscious of the superiority of the interior world. Minds, as we know them, exist in structures composed of material substances which the mind itself subtracts from the universe about it. From the moment when the infant takes its first breath—and indeed before—it systematically draws matter from the material world, and returns it after a time to the material world again. The mind itself, or at least its identity, does not change, but the matter which it uses is constantly coming and going. It is the mind, therefore, which creates and rules the body.

With some limitations the same may be said of the

mind's relation to its environment. Beings possessing minds, or something resembling minds, control and order the inorganic substances about them; and among minds, the higher we climb in the animal series and the nearer we approach the human or perfect mind, the greater the control. The higher controls and orders the lower. A convulsion of nature may, at times, seem to reverse the process, and minds of a higher order may give way to those of a lower—as when an animal, an insect, a microbe, or even an animal or a vegetable poison, destroys the life of a human being. Such cases, however, are admittedly exceptional and reverse the natural process. The regimentation of the environment by mankind is one of the most impressive of the phenomena of our modern world. As between our two worlds, therefore, it is evident that the world of thought and feeling controls the world of matter and motion. It is the one that causes.

And this common perception is embodied universally in the belief in a Being in human form who is the efficient cause of all things. In the human form mind reaches its highest development and shows its greatest powers. It is natural, therefore, that we should conceive of the ideal Mind as nearer the human mind than any other; that we should look to the human mind as the vanishing point towards the Infinite Mind.

From the apparent separation of minds and bod-

ies at death mankind also believes, or is strengthened in the belief, in a world of minds within or above nature.

The world of causes, therefore, is the world of the Deity and of the minds which once inhabited bodies similar to our own.

The essence of all causes is to be found, then, in mind; but the mind is expressed in the body, and if the human organism is the nearest in its approach to Deity, it must contain the nearest approach to an interpretation of Him. From this it seems that the human is a medium for the interpretation of the world in terms of the Deity. Or, as Swedenborg might put it: (1) the world or macrocosm was created by the Deity through correspondences and therefore reflects Him in every part as in a mirror, but (2) the most perfect correspondence is with the human, the microcosm.

What has been said thus far is in substantial agreement with the belief professed by Christians of all denominations, and indeed by numbers of people outside of Christian communions. Yet, unlike Swedenborg, they have failed to make the logical deductions from it, for, if it is worth anything at all, this correspondence of God, man, and the sub-human world is to be taken in a complete sense. Whatever unperverted faculty man has, he must derive from something corresponding to it in the Deity. Every part of his structure depends, as we know, on its

physiological function, but we have been slow to grasp the truth that both together must have their origin in a corresponding form and function in God or they would not be. In the same way must every animal, every plant, the parts of each, every inorganic element, and the phenomena to which they give rise correspond to something in the Deity, for all come from Him. Our world must be, in effect, a revelation of God.

And this correspondence must apply not merely to substance but to process, not merely to material things as they present themselves at any one moment but to the alterations among and within these, and such a process is evolution.

Our universe presents an appearance of permanence and stability under the control of what we are pleased to term "natural law." Changes take place, but the most familiar of these seem to run in cycles, repeating the same phenomena over and over again. Thus, there is the cycle caused by the rotation of the earth on its axis, the cycle caused by its revolution about the sun, the cycle which the solids and fluids of the globe are ever repeating, from continent to ocean and ocean to continent, the cycle of life in plant, animal, and human being. But, when we look at these cycles more closely we discover that no round repeats a previous round exactly. If there were no other cause of change, it would be found in the number and complications of the cycles

themselves, which cut each other at all possible angles and perpetually introduce variety into each other's operations. The miracle of nature lies not in its uniformity or the delicacy of its adjustment alone, but in the fact that, with an ostensible uniformity, it includes perpetual diversity; not that it is constantly changing, but that *the rate of change* is constantly changing. And the ultimate reason for this is to be found in a basal principle which Swedenborg reiterates again and again: "Sustentation is perpetual creation," or "Existence is continuous coming forth." Inmostly to the cycles which our universe exhibits is the cycle from the Creator to the creation and *vice versa*. Yet so like are they all that to Swedenborg the unfoldment of a universe differs not at all in kind from the unfoldment of a bird. Indeed, it is significant that, like Huxley, he perceived in the development of an egg a perfect image of cosmic evolution.

But while the evolutionary theory to which Huxley and his contemporaries subscribed enjoyed an immense advantage in the multitude of facts by which it was supported, it fell short of Swedenborg's in completeness and in the number of fields of thought which it harmonized.

Scientific evolution professes only to explain the relations observed between certain organisms, or at most certain phenomena, but all it has been able to accomplish is the practical demonstration that evo-

lution has taken place and the charting of many of the lines which it must have followed. To it the inner machinery, the cause of the process, is still a mystery.

Moreover, all that students of inorganic evolution ever attempted was to trace the cosmos from what they conceived to be a relatively simple gaseous nebula to the production of planetary bodies, while evolutionists of the organic group started with the mineral kingdom and ended with the more complex plants, animals, and men. Swedenborg went beyond them in both directions. He began his cosmic evolution with the Infinite, traced it stage after stage to the mineral kingdom, and from the life involved in this kingdom pictured all organic evolution as but a return journey to the Infinite from whom it came. He does not stop with man, but with the Divine Man through whom the universal cycle reached its conclusion and attained again to the Infinite. Thus Swedenborg's system did not rest at the explanation of purely material things. It involved a complete philosophy and a complete theology. The principles which he had applied to an exploration of the natural universe up to men were turned also upon the course of human history and upon the Sacred Writings and were found equally applicable.

It will be said that this is mere speculation. But speculation has a recognized standing in scientific investigation, though we dignify it with the more refined terms theory and hypothesis. The nebular

hypothesis, the planetesimal hypothesis, Neo-Lamarckism, and Neo-Darwinism represent such hypotheses. In Relativity the distinctions between scientific and philosophic hypotheses seem well nigh effaced. These hypotheses are formulated to account for the origin and continued existence of *some of* the phenomena of the cosmos. It should be no more unscientific to formulate an hypothesis to account for the origin and continued existence of *all of* the phenomena of the cosmos.

Swedenborg's working hypothesis is not, however, merely a justifiable attempt to account for observed facts; it accounts for them in a logical manner. Our experience is to the effect that mind creates and organizes; for the artificial world, or the *artificed* world, is an expression of the human mind throughout. Everything in it is for a human purpose and corresponds to some human need—need for food, clothing, shelter, companionship, aesthetic and religious satisfaction. We have, therefore, the best analogical grounds for assuming that the natural world, including man himself, is a similar expression of a creative and organizing power, and is directed toward the satisfaction of corresponding, if less material, needs. This is, at least, the only hypothesis which the facts indicate. The full implications of it were grasped by Swedenborg and expressed in his doctrine of correspondences, which, according as you are pleased to designate it, was the discovery of a genius or a

revelation to a "servant of the Lord Jesus Christ," —or both.

A charming picture of creation through correspondences is given in Swedenborg's last great work, *The True Christian Religion* (n. 78), and there is all the more reason for mentioning it since it has frequently been quoted as proof that Swedenborg's cosmogony cannot be made to harmonize with any evolutionary theory. It is part of a Memorable Relation appended to our author's discussion of "The Creation of the Universe," and is as follows:

> "The next day an angel came to me from another heavenly society and said: 'We have heard in our society, that because you had meditated about the creation of the universe, you were summoned to a society near ours, and there related matters respecting creation which the society then favored and afterwards rejoiced at. I will now show you how all kinds of animals and vegetables were produced by God.' And he led me away to a wide green plain, and said, 'Look around.' And I looked around, and saw birds of most beautiful colors, some flying, some sitting upon the trees, and some scattered over the plain plucking little leaves from the roses. Among the birds were doves and swans. After these had disappeared from my sight, I saw not far from me flocks of sheep with lambs, of kids and she-goats; and

> round about these I saw herds of cows and calves, also of camels and mules, and in a certain grove deer with high horns, and also unicorns. After these things had been seen the angel said, 'Turn your face toward the east.' And I saw a garden containing fruit trees, orange trees, lemon trees, olives, vines, fig trees, pomegranates, and also shrubs bearing berries. The angel then said, 'Look now toward the south.' And I saw fields of various kinds of grain, wheat, millet, barley, and beans, and round about them beds of flowers containing roses of beautifully varied colors; but toward the north I saw groves filled with chestnut trees, palms, lindens, plane trees, and other foliaceous trees. After these things had been seen, the angel said: 'All these things that you have seen are correspondences of the affections of the angels who are near.' And they told me to what affection each particular thing corresponded; and moreover, that not those only, but also all other things which presented themselves to our sight, were correspondences, as houses, their furniture, tables and food, clothing, and even gold and silver coins, as also diamonds and other precious stones, with which wives and virgins in the heavens are adorned. They said: 'We perceive from all these things the character of every person as to love and wisdom. The things that are in our houses, and are of use, remain there constantly; while in

the sight of those who wander from one society to another, they are changed according to associations. These things are shown you in order that you may see a type in particulars of creation in general; for God is Love itself and Wisdom itself; the affections of His Love are infinite, and the perceptions of His Wisdom are infinite; and every thing and all things which appear on earth are correspondences of them. Hence are birds and beasts, forest trees and fruit trees, crops and harvests, herbs and grasses. For God is not extended, but is still present throughout all extent; thus throughout the universe from primaries to ultimates. And because He is omnipresent, such correspondences of the affections of His Love and Wisdom exist in the whole natural world; while in our world, which is called the spiritual world, exist similar correspondences with those who receive affections and perceptions from God. The difference is, that in our world such things are created in a moment by God according to the affections of the angels; but in your world they were similarly created in the beginning; while it was provided that they should be perpetually renewed by the propagation of one from another, and that so creation might be continued. The reason that creation is effected momentarily in our world, and in yours is made permanent by propagation, is because the atmospheres and earths of our world

are spiritual, and those of your world natural; and natural things were created to invest spiritual things, as the skin invests the bodies of men and animals, as the outer and inner barks invest the trunks and branches of trees, as the *meninges* invest the brain, the tunics the nerves, and the inner coats their fibres, and so on. Therefore it is that all things which exist in your world are permanent, and are constantly renewed year by year.' To this the angel added: 'Relate what you have seen and heard to the inhabitants of your world, because they have hitherto been totally ignorant of the spiritual world; and without some acquaintance with it no man can know, nor even guess, that creation is a continuous process in our world, and that it was the same in yours when the universe was created by God.'

No one who has read the earlier parts of this essay with care will accept the above quotation as a blanket denial of evolution. Swedenborg is here trying to emphasize two points: (1) that creation is by correspondences, and (2) that it takes place instantaneously in the spiritual world because environment there is entirely dependent on the minds of the inhabitants, while in this world, where environment is only indirectly dependent on human beings, it normally proceeds through generative and other natural processes.

The life histories of plants and animals consist, in large measure, in what seems to be an unvarying repetition of life cycles, but when we study these cycles we discover that changes are introduced, sometimes slowly, sometimes rapidly, until in time the plants and animals in question have altered their forms very greatly. Nor do we have to appeal for proof of this to fossil records covering hundreds of thousands and even millions of years. Changes of the kind have been observed in living species, taking place under the eyes of investigators, as in the mutations studied by De Vries and his followers, and in the remarkable shifts in species noted by Prof. H. E. Crampton among snails of the Pacific islands.[1] If any of these organisms is built up by a thousand, or a million, changes, the process is not different in kind from what it would have been if it had resulted from a single mutation—just as there is no essential difference in the net result when a man travels from New York to San Francisco, whether he goes straight through or stops at various places along the way. The small increment of change is as novel, as little explicable by processes of reproduction, as would be a "special creation" of the entire organism outright. In effect, therefore, we have to deal with the two factors which Swedenborg and his angelic associates were discussing in the above Relation.

[1] "Contemporary Evolution of South Sea Island Snails," in *The Scientific Monthly*, vol. XXI, No. 2, Aug., 1925, pp. 140-141.

Whatever is essential to any plant or animal has come into it by what the older evolutionists called accidental variations and the later ones know, more correctly, as mutations, and these, of course, are afterwards propagated in the ways proper to the organism in which they appear. Only an enslaved literalist will refuse to be satisfied unless the organism is conjured in one process out of the dust of the ground. We have already given evidence that Swedenborg himself was no such literalist.

Evolution, then, is nothing more nor less than progressive creation. In the inorganic world it expresses itself as associations of electrons, protons, atoms, molecules, and aggregates of these; in the organic world as mutations; in the world of human culture as new ideas. But, if we are to accept the principle that "sustentation is perpetual creation" in its complete sense, we must broaden our conception still more; we must then say that everything is constantly being renewed, that sometimes this involves a mere replacement, or apparent replacement, of older material and at other times a change in the material itself or an addition to it. Change must then be regarded merely as a perceivable increment in a ceaseless process which we know in part as evolution, but which Swedenborg envisions as a perpetual cycle having in view the eternal perfecting of life.[1]

[1] Since the above lines were written R. A. Millikan has presented the first scientific proofs of building up as a current process in the inorganic world. See *Science*, Vol. LXVII, No. 1737, April 13, 1928, pp. 401-402.

CONCLUSIONS

IN the first part of this work I have endeavored to make plain the essentials of evolution, to give an idea of the history of the conception and the place which Swedenborg's hypotheses occupy in that history, besides taking note of some of the points in which Swedenborg and modern investigators are found to be in agreement.

My next object has been to show that Swedenborg's cosmogony was not only evolutionary but founded upon observed facts, even though the deductions at times proved erroneous. His system rested in the main upon a very solid chain of reasoning, which may be represented somewhat as follows:

1. Law prevails throughout the universe, a fact which may be explained in but two ways; either it is abstract, impersonal law, or it is the work of a Lawgiver.

2. Accepting the latter alternative, it is logical to assume that the cosmos reflects God as a whole and in every part, or, in Swedenborg's terminology, that there is a complete correspondence between the Creator and the creation.

3. If material objects have such an origin and such a correspondence, material processes have it also.

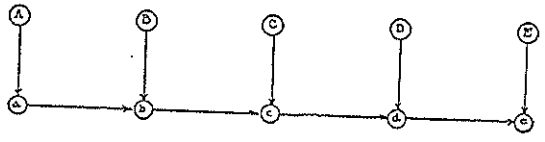
4. It is a matter of observation that events in nature move in cycles, some shorter and some longer, from which—as well as from other considerations—we may with practical certainty assure ourselves that the entire cosmos is itself passing through a cycle.

5. Observation also indicates that this cycle must have embraced two stages: (i) an involution of the higher in the lower, beginning from the Infinite and passing through several successively grosser series of atmospheres to the mineral kingdom and the main substances of our planets, and (ii) an evolution through the plant and animal worlds successively to the human, and ultimately to the Divine, thus completing the cycle. The first limb of this process has already been sensed in the world of science and exploited as the "nebular hypothesis," the "planetesimal theory," and so on. The second limb has also been sensed and in part exploited in the scientific world under the name of "organic evolution."

Incidentally I have attempted to show that Swedenborg's descriptions of early man may be reconciled, in the main, with what we know as the result of latter day paleontological and archeological investigations, and in particular that the break between his "Most Ancient" and "Ancient" people agrees remarkably

with that between the Neanderthal or Mousterian man and *Homo sapiens*.

Finally, I would take leave of this subject by completing and emphasizing the thought with which I began my very first chapter—perhaps the most important thought in the entire discussion. What we call evolution is merely our perception of the successive production of material things which, while apparently causing one another, are actually caused from the interior world. In the accompanying diagram [1] let *a*, *b*, *c*, *d*, and *e* represent so many entities



introduced successively into the world of our sense experience. Then the course of evolution runs from *a* to *e* along the line marked by the horizontal arrows, and causation seems to pass from *a* to *b*, *b* to *c*, *c* to *d*, *d* to *e*, etc., each preceding entity being the "cause" of the entity following. But the truth is that each entity, although making its appearance by means of something preceding in the same plane, actually originates from a corresponding spiritual entity *A*, *B*, *C*, *D*, *E*, as indicated by the vertical arrows. If *d*, for instance, were the absolute cause of *e*,

[1] As the spiritual entities A-E have their ultimate origin in the Infinite, there is no essential difference between this diagram and that on page 7.

there would be nothing in *e* not present in *d*, when in fact *e* never is precisely like *d*. It is true that certain changes appearing in *e* and not in *d* are known to throw back to some earlier ancestral form (*a*, *b*, *c*), but all such inherited differences taken together do not account for *all* of the peculiarities which *e* presents. And even if we concede that *e* is sometimes a mere complex of its forebears, that is not always the case or there would be no evolution, and the new factors, or positive "mutations" are absolutely inexplicable in terms of *e*'s ancestral forms. On the other hand, all variations without exception are explicable on the supposition that they are results of inwardly acting causes in a realm in which absolute Life resides. Life, or particular forms of it such as *A-E*, are principal causes; *a-e* are instrumental causes; and Swedenborg says of these:[1]

"Both a principal and an instrumental cause are necessary to every production, and these two causes, when anything is being produced, appear as one, though they are distinctly two; wherefore it is one of the canons of wisdom, that the cause principal and the cause instrumental make together one cause. So also do what is spiritual and what is natural. The reason that, in producing effects, these two forces and causes appear as one, is, because what is spiritual is within what is natural, as the fibre is within the muscle, and as the blood is within the arteries; or

[1] *Influx*, n. 11.

as the thought is inwardly in the speech, and the affection in the tones of the voice, causing themselves to be apprehended by these natural instruments. From these considerations, though as yet as through a glass darkly, it appears, that what is spiritual clothes itself with what is natural, as a man clothes himself with a garment."